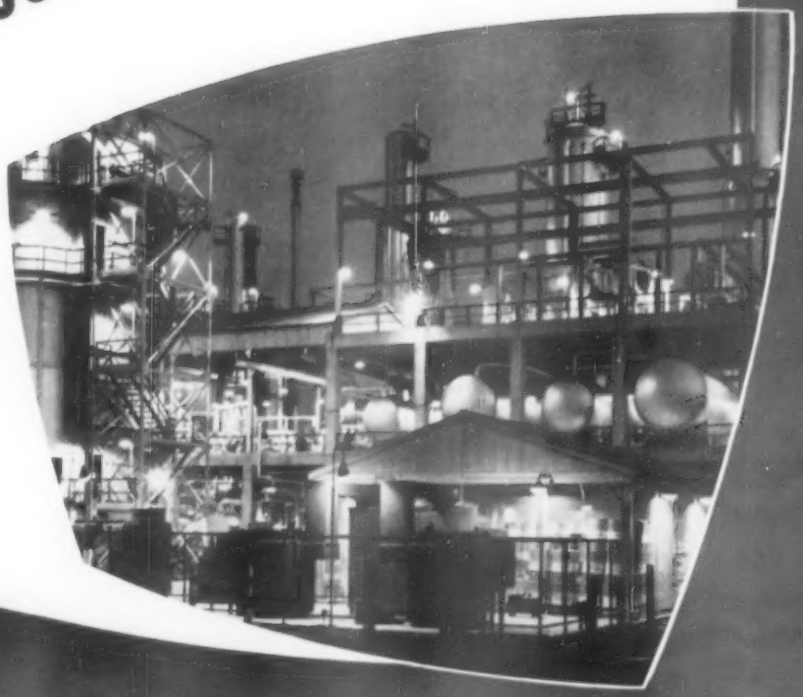
the OIL AND GAS JOURNAL

JULY 4, 1955

New Reforming Process Boosts Octane Number

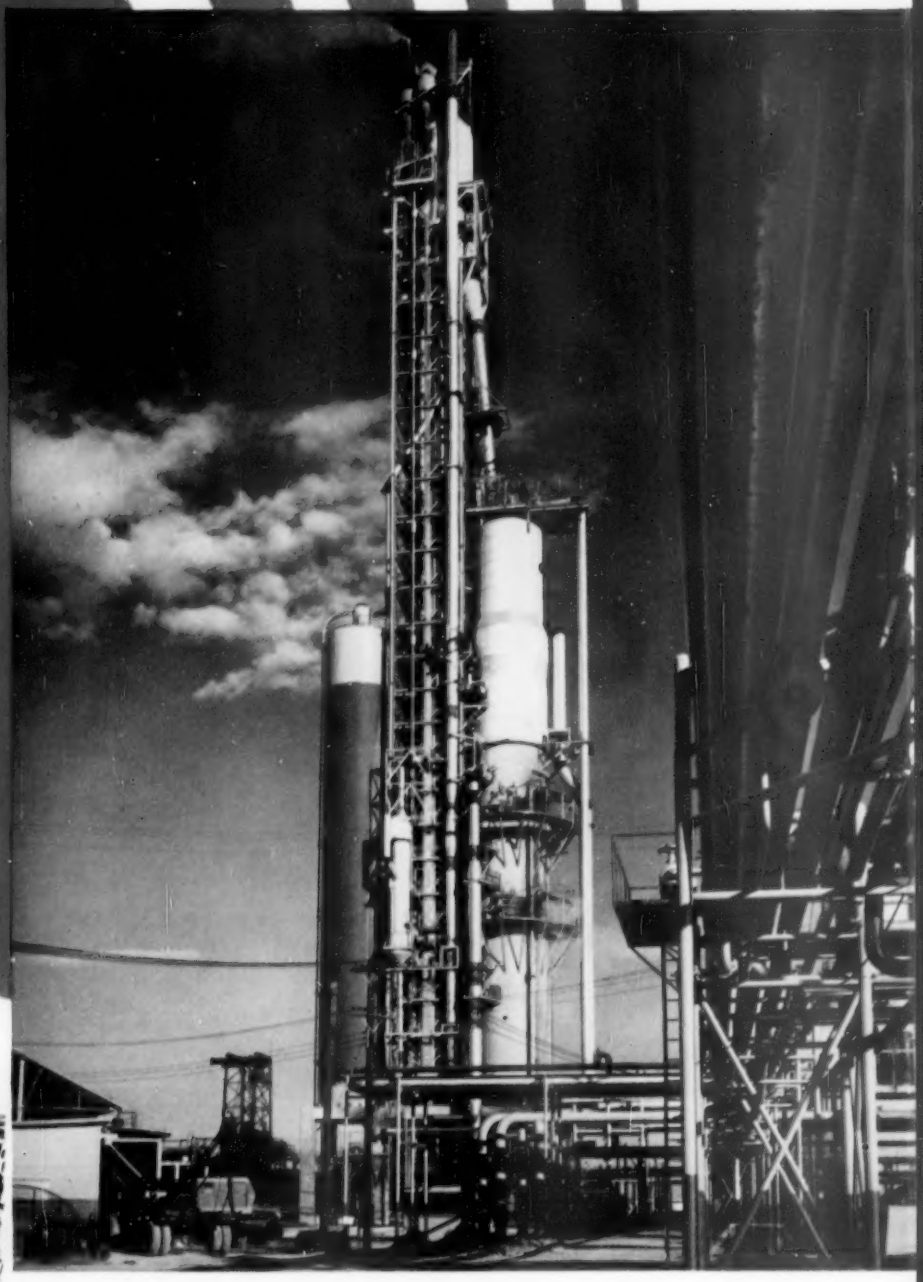
Platinum Catalyst Is Regenerated In Place

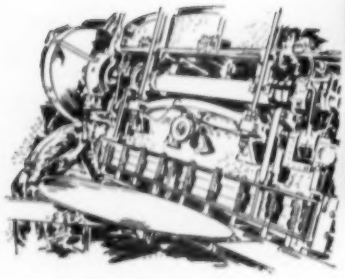
P. 80



Offshore operators prepare for confusing sale of leases in Louisiana's tidelands • P. 60

THERE IS ALWAYS TOMORROW





• Whenever research comes up
with one process accomplishment,
it has opened the doors
to another score of possibilities.
For that reason Wyatt's facilities,
along with being adequate for today,
are always ready for tomorrow.

Wyatt's
HOUSTON-DALLAS-NEW YORK-TULSA

MANUFACTURERS AND ERECTORS SINCE 1913

PAGE 1 ONE . . . a glance ahead

Harris bill supporters are not quite so pessimistic as they were a couple of weeks ago, now think bill's chances of passage have gone back up to about 50-50. Price of legislation may be full-dress congressional investigation of gas industry, including reexamination of producers' position.

Octane ratings in the Mid-Continent are creeping up from 86 to 89 for regular and from 94 to 97 or 98 for premium gasoline, and some big refineries are expected to be making 100-octane motor fuel within a year. Smaller plants in the area can barely meet the new competition, fear being squeezed out if octane demand goes up again.

Acrolein is getting much interest as new petrochemical building block. This highly reactive acrylic aldehyde can make hundreds of derivatives, may become as important as ethylene. Other companies may follow Shell Chemical in building new facilities for low-cost acrolein.

New L.P.G. research and promotion program promises to develop new markets for butane, propane. Biggest immediate growth looked for as fuel for internal-combustion engines, but use in home heating and central gas systems will be plugged. Work will also be done to make savings by transportation in insulated instead of pressure vessels.

Punch-card data and electronic calculators (as distinguished from plant automation) promise to give refiners much closer control of costs than was ever possible before. Some refiners are convinced this will lead to substantial changes in refinery operations.

Threat of quota on imports has been important factor in keeping imports high during past year, causing individual importers to jockey for position in case of a freeze. Some importers admit privately they would curtail now if there were assurance that this will not be used against them in the future.

The OIL AND GAS JOURNAL

JULY 4, 1955 • VOLUME 54 • NUMBER 9

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OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

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TECHNOLOGY—OPERATION

Cat Reforming With In-Place Regeneration 80

By W. H. Decker and David Stewart

First use of the Sinclair-Baker RD-150 catalyst has been in the cat reformer at the Sinclair Marcus Hook refinery. The catalyst has excellent reforming characteristics. It can be regenerated easily and quickly in place. Exact processing conditions can be chosen to secure optimum economic operation.

Safety in Drilling Operations 85

By Jack Auser

Management has responsibility to provide tools required for safe operation. The tool pusher should make sure that proper safety regulations are followed during the drilling. Crews should be safety conscious and work well as a team.

Why Oil-Well Tubing and Casing Fail, Part 1 86

By H. G. Texter

This article on why oil-well tubing and casing fail in tension and why they collapse is the first of a series on casing and tubing troubles. These articles will give, from the author's 30 years of experience, everything possible about what causes the failures.

Factors in Evaluating a Drilling Rig 97

By Gene Graham

Several factors must be evaluated in selecting one drilling rig from a group of rigs for a given job. The type of well, location restrictions, well program, anticipated hole conditions, type of contracts, and machinery are major factors to be evaluated.

Why Standardize Blowout Preventers? 101

By F. E. Spencer

Standardization aids in correct and complete use of blowout preventers. It also helps promote other economies in design of substructure, flow line, hydraulic piping, etc. Best of all, standardization simplifies the education of rig personnel.

How a Small Company Got Into Petrochemicals 102

By W. K. Jackson and D. M. Krause

A small refiner can profitably exploit petrochemical opportunities if he exercises normal business prudence and recognizes that he has actually already experienced chemical manufacturing techniques. Each refinery process stream can then be analyzed for possible petrochemical operations.

Cleaning Pipelines With Detergents 107

By Clinton McClure

El Paso Natural Gas Co. uses a detergent-water method for line cleaning. This has proved highly successful with minimum down time. In one case the method raised the efficiency by 22 per cent and made possible a yearly savings of $48,000 on 50 miles of line.

Pipeline Patrol: Solving a Limited Right-of-Way Problem 131

By D. H. Stormont

Anodes placed some 40 ft. below ground level, rather than in the 10 to 12-ft. holes conventionally used, solved a narrow right-of-way problem for Shell Oil Co. when it undertook cathodic protection of pipelines interconnecting the Wilmington-Dominguez refineries.

REGULAR FEATURES

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The Foreman's Page 118

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Modern Drilling 125

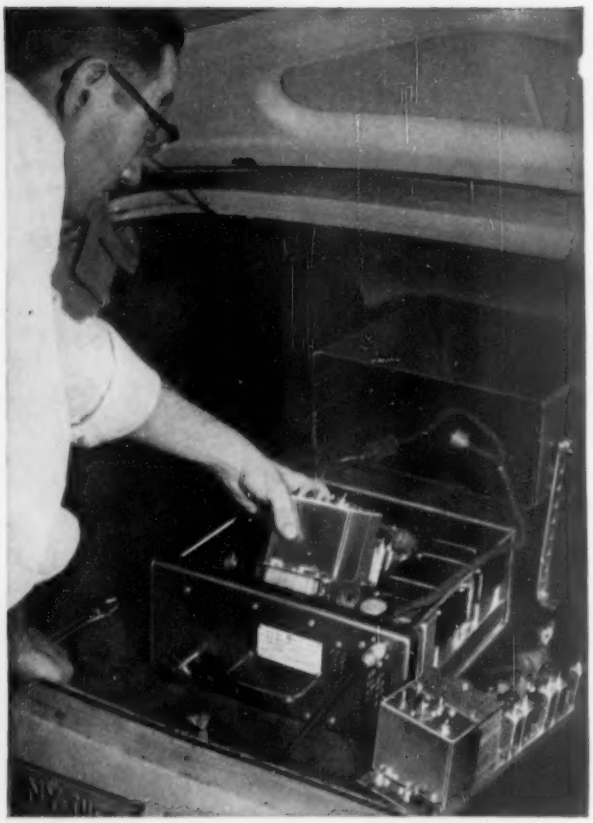
G.E. DEVELOPS NEW PLUG-IN CHASSIS FOR 2-WAY RADIO

NEW PROGRESS LINE saves money on maintenance through faster servicing—protects from obsolescence because chassis are quickly interchangeable.

IN the new Progress Line, transmitter, receiver, power supply and optional chassis are individually rack-mounted in a triple-rigid mobile case. Rapid interchangeability is provided by this rack construction and true plug-in chassis. This plug-in design permits changes in frequency, power, type of reception (narrow or wide band) quickly *at minimum cost, at any time.* You're free of any obsolescence risk!

You may switch Progress Line mobile units—whether front or trunk mount, between vehicles with 6 or 12 volt DC systems. No electrical alterations are needed. And any mobile combination can be converted quickly to a low-cost, 117 volt AC intermittent duty base station by changing only the power supply chassis!

Let a G-E Communications Counselor analyze your radio needs and develop an installation or conversion program planned for long-run savings. Write or call today for full specifications on the new PROGRESS LINE. *General Electric Company, Communication Equipment, Section X875-4, Electronics Park, Syracuse, N. Y.*



INDIVIDUAL PLUG-IN CHASSIS minimize capital investment in spares and reduce radio maintenance time! Your vehicles will be back "in service" faster. For instance, you can replace either a transmitter or receiver plug-in chassis right in the vehicle in 5 minutes—using only a screwdriver. Individual plug-in chassis of the new General Electric Progress Line units also provide complete interchangeability between mobile and station transmitters and receivers.

There is a G-E Authorized Service Station near you. Look for this sign.

EASY FRONT MOUNTING under the dash. The new G-E Progress Line case is less than 15" deep. For the first time you can have a 90-watt front mount mobile unit in the 25-54 MC band and a 50-watt front mount mobile unit in the 144-174 MC band. In the 25-54 MC band you can now have simultaneous monitoring of 2 channels, in the same case, without additional equipment.

Progress Is Our Most Important Product

GENERAL ELECTRIC

A. O. Hamon is shown here en route to Chile—in one of a series of ads about Du Pont Petroleum Chemicals Division representatives and the services they provide the oil industry.

The view from A. O. Hamon's "office" window

is 6,860,000 square miles big

AN ENTHUSIASTIC PHOTOGRAPHER, A. O. Hamon uses a camera with an artist's touch. An engaging conversationalist, he has an eager capacity for friendship. He was born and educated in Texas. And his extensive travels since then give him an intimate knowledge of many far corners of the world.

SOMEWHERE between Panama and Magellan Strait . . . between Lima and Recife . . . is where you'll generally find A. O. Hamon.

Between calls at the many oil company offices and refineries scattered throughout South America, he catches up on his paper work in the seat of an airliner. His briefcase serves as his desk.

"A.O." as he is known to his friends, is one of three Latin American export sales-service representatives of the Du Pont Petroleum Chemicals Division. He lives in South America the year 'round, maintaining a home base in Caracas, Venezuela. He also covers part of the Caribbean area, making occasional trips to Trinidad, Aruba and Curacao.

When the picture above was taken, "A.O." was en route to Chile to help with a blending plant start-up at a new refinery. On this particular trip he spent ten days at the refinery, working with the blending plant superintendent. Since he speaks Spanish fluently, he was able to help with the training of blending plant personnel and give several talks to the men on safety procedures.

In addition to carefully inspecting the blending plant before start-up to make sure there were no leaks, "A.O." stayed on for a couple of days after it was on stream to advise on operational problems.

This blending plant start-up is a typical example of the services provided by Du Pont representatives wherever tetraethyl lead is used. Young, energetic, technically trained men like A. O. Hamon can make these services a valuable contribution to your own far-reaching operations.

DU PONT

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5 GOOD TIPS

for Better Performance with Less Maintenance of your "Oilwell" and Wilson-Snyder Slush Pumps

Piston Rod Packing for Diaphragm and Stuffing Box

Pressure-seal stuffing box packing is manufactured to "Oilwell's" exacting standards from molded duck and synthetic oil-and-water-resisting composition and packaged in combination sets with alternating Buna-N rings. Floating oil seals in the diaphragm have lips turned in opposite directions to seal in lubricants and seal out foreign matter.

USE "OILWELL" PARTS FOR "OILWELL" PUMPS

Liner Sealing Rings for "Tell-Tale" Liner Packing

The two replaceable sealing rings which are separated by a metal lantern ring, have a flexible core of special rubber compound encased in an oil-and-water-resistant duck compound molded together under high pressures and temperatures to resist extrusion from liner spacer adjustments under severest service conditions.

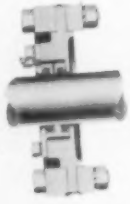
Cylinder Head and Valve Cover Gaskets

. . . for larger pumps are hot-molded from duck with an oil-and-water-resisting compound, impregnated throughout. This results in a tough, hard-yet-pliable gasket that will take highest load pressures.

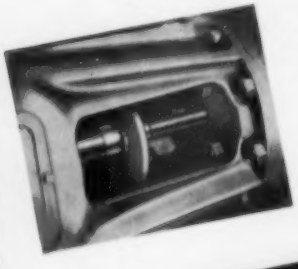
USE "OILWELL" PARTS FOR "OILWELL" PUMPS

Parts for Diaphragms and Stuffing Boxes

All parts for fluid piston-rod stuffing boxes and diaphragm stuffing boxes can and should be replaced when worn or damaged to insure effective packing performance.



Flexible Mud Baffles



. . . prevent mud or water from traveling along rods to damage diaphragm packing at the power end. They can be installed or replaced in the field and do not interfere with stuffing-box-packing adjustments.

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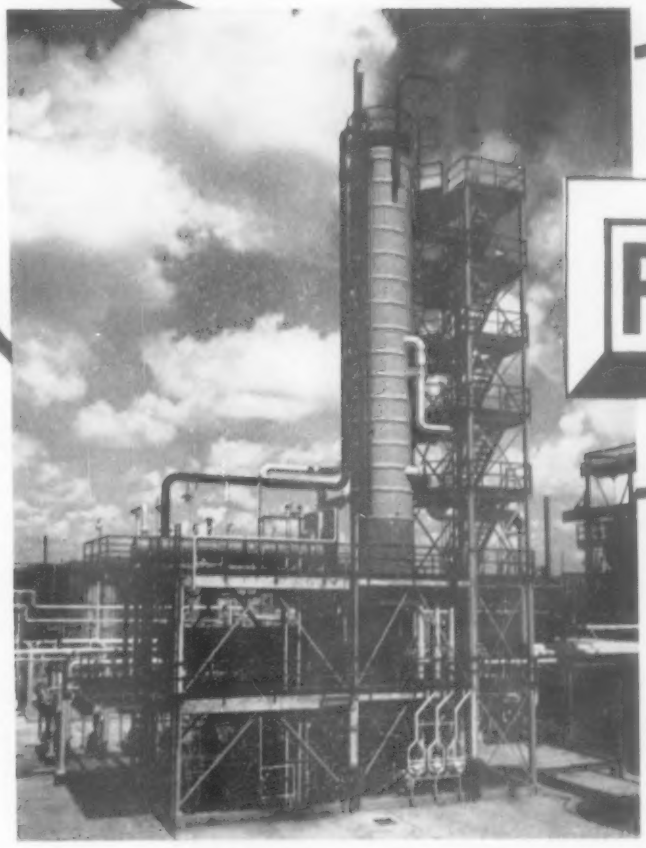

PARSONS

When Esso Standard Oil Company wanted a distillation unit for lubricants production they selected The Ralph M. Parsons Company from competitive bidders to do the job. This plant has been in operation at Baton Rouge, Louisiana, for nearly a year.

By having Parsons handle mechanical design, procurement and construction, Esso gained all the advantages of working with a single organization with a single responsibility.

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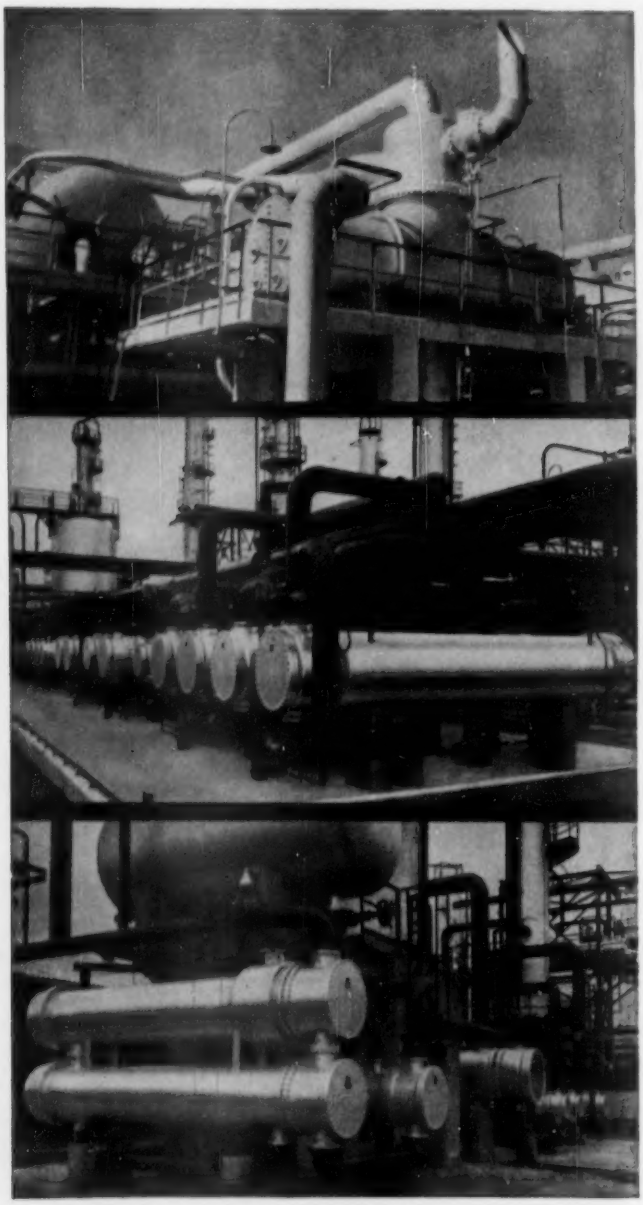
this...

ROSS

on your specially engineered exchanger means BONUS VALUES



Specially engineered exchangers designed and built by Kewanee-Ross embody features and services that have long been acclaimed throughout the refinery and petrochemical industries. "Bonus values" . . . they're called.

Characteristic Kewanee-Ross standardization is one of them. Substantial delivery time and savings in engineering costs can often be gained through the suitability of standard components for many specially engineered units.

A large stockpile of engineering experience is another. Kewanee-Ross engineers have had long experience with many special and unusual applications. Designing and production are off to a faster start.

Long a leader in the heat exchanger and surface condenser fields, Kewanee-Ross is today in the best position of its history to meet your requirements. Now, with the added capacity of a second large plant (Kewanee, Ill.), recently re-equipped with completely modern machinery and supervised by key "Ross trained personnel," Kewanee-Ross is ideally situated to supply all types of heat exchangers, built to any code, on a very favorable delivery schedule.

Arrange an immediate consultation with the Kewanee-Ross representative nearest you, at your earliest convenience. You have only your time to invest.

KEWANEE-ROSS CORPORATION

DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

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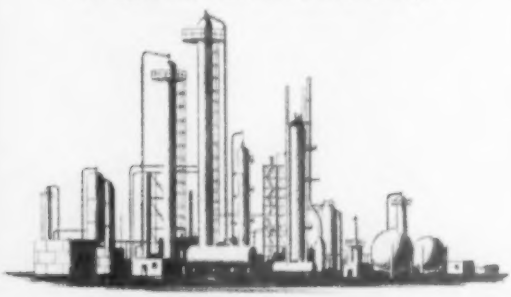

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Pritchard-built dehydration plant of the Southern Natural Gas Company in Gwinnville, Miss.

DRY means **DRY** especially when you're talking about treating natural gas. There can be no if's, and's or but's.

That's why the gas industry has grown to respect and specify Pritchard for the engineering and construction of dehydration plants. When Pritchard designers say dry, they *mean* dry. Yes, Pritchard has proved its exceptional ability to design and engineer such facilities. And, then, follow up with construction that is directly translated into greater production and profit for you.

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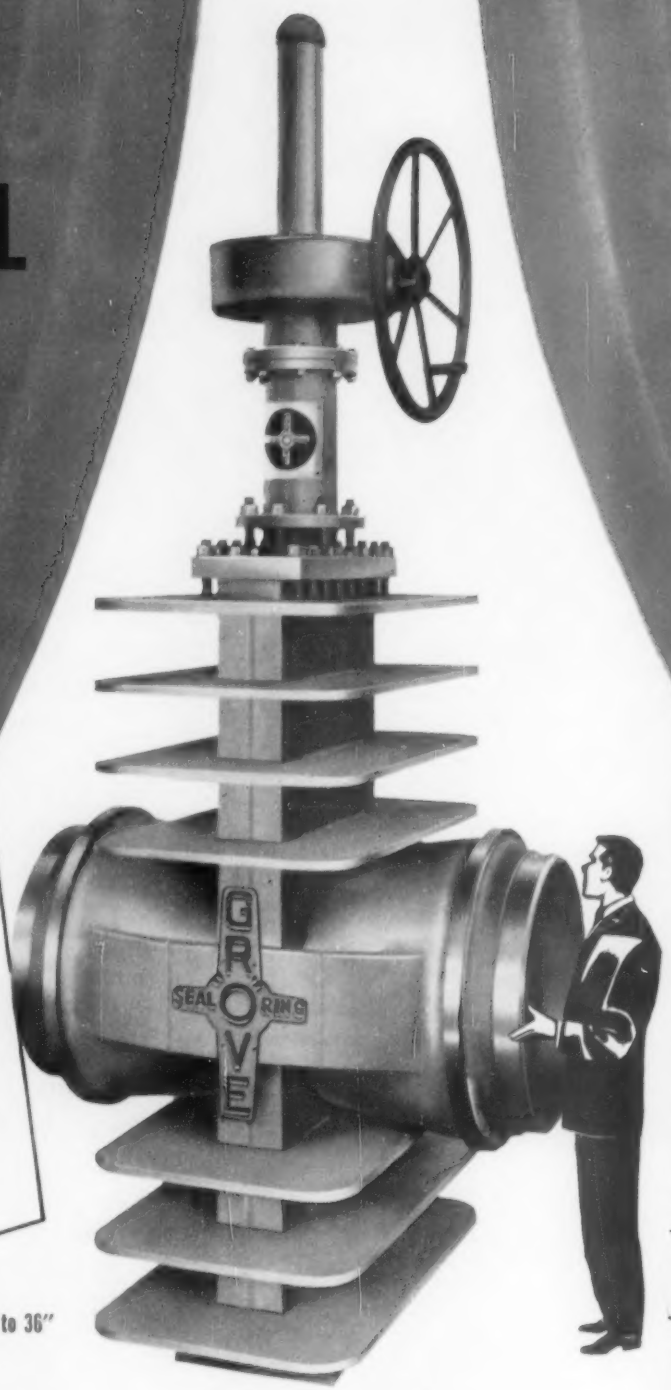
Exclusive Grove fabricated steel body design makes Seal-"O"-Ring gate valve advantages now available through 36" for all pipeline pressures

For the full story on the valve of tomorrow — already proved in use today — contact your Grove representative, or phone, wire or write for details.

Valve sizes from 2" to 36"



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GROVE SEAL-"O"-RING Gate Valves

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GROVE SEAL O RING
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SIMPLICITY ACCURACY SAFETY

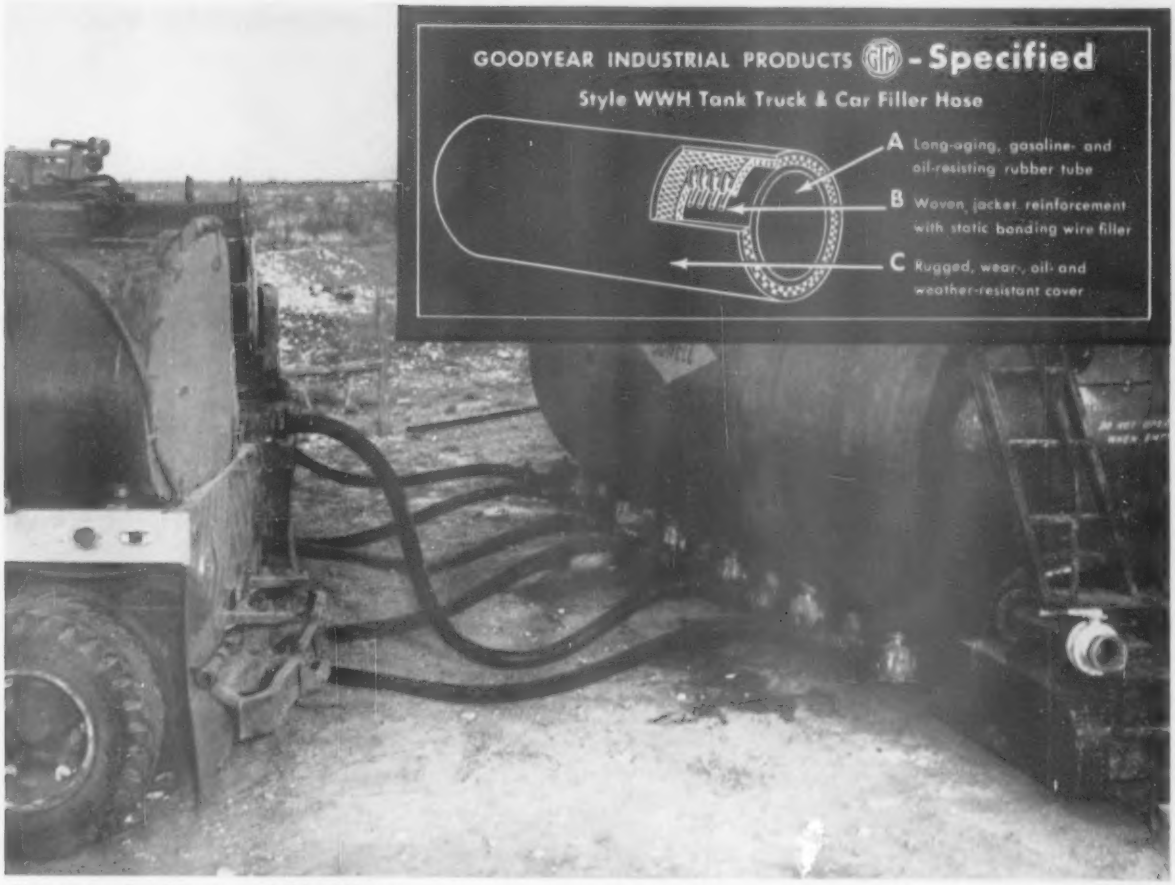

GOODYEAR INDUSTRIAL PRODUCTS G.T.M. - Specified
Style WWH Tank Truck & Car Filler Hose
A Long-aging, gasoline- and oil-resisting rubber tube
B Woven jacket reinforcement with static bonding wire filler
C Rugged, wear-, oil- and weather-resistant cover

Photo courtesy Dowell Incorporated, Tulsa, Oklahoma

The hose that props up tired wells

IN the Sprayberry Trend Area of West Texas, high-volume, high-injection-rate fracturing of low-producing wells is upping production by four to twelve times.

Developers of this rejuvenation process faced many problems in handling the quantities of oil/sand mixture required for increased penetration and "propping" of the fractures. Not the least of these was finding a hose that would safely and economically carry the fracturing fluid from trailer mixers to suction manifold to pump trucks. The G.T.M.—Goodyear Technical Man – was consulted. He specified Style WWH Tank Truck & Car Filler Hose (see blueprint) for the job.

Result: Together with a special well-head manifold and "down the casing" treatment, the trouble-free operation of Style WWH in this high-pressure, highly erosive service has permitted injection rates as high as 66 bbl. per minute. Wells formerly producing 25 bbl. or less per day are now yielding 100 to 300 bbl. daily.

How can the G.T.M. help you with your hose problems? You can contact him through your Goodyear Distributor or by writing Goodyear, Industrial Products Division, Akron 16, Ohio.

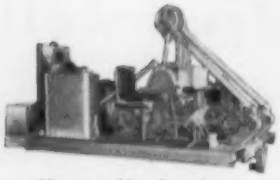
YOUR GOODYEAR DISTRIBUTOR *can quickly supply you with Hose, Flat Belts, V-Belts, Packing or Rolls. Look for him in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods."*

STYLE WWH TANK TRUCK & CAR FILLER HOSE by

GOODYEAR

THE GREATEST NAME IN RUBBER

Comparison proves the MICHIGAN 3/8-yd. Truck Hoe YOUR BEST BUY



Upper Mechanism

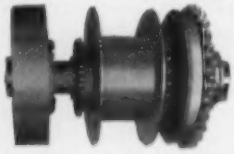
The MICHIGAN® TM-6 is a heavy duty 3/8 yd. 7½ ton upper mechanism for mounting on your own truck or at the factory on a new 6x4 or 6x6 truck. The TM-6 is available on the Clark Lease Plan. Write for Bulletin 111.

Power Control

Air Controls are standard on all MICHIGANs . . . fast, smooth, precise, with low operator fatigue. No heavy levers to push or pull—air rams do the actual work.

Smooth Clutches

There's nothing smoother than MICHIGAN air-operated segmented disc clutches . . . and they are self-compensating for heat, self-ventilating and self-cleaning. All segments are interchangeable.

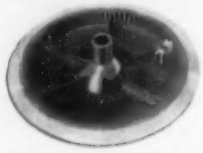


Power Load-Lowering

Four shafts on the TM-6: Swing, Hoist, Intermediate and Crowd . . . each with its independent clutches. For precision crane work, the hoist line can be reeved on the front drum to provide Power-Up and Power-Down.

Hook Rollers

You can swing the boom by leaning against it. There are 5 ball bearing-mounted adjustable rollers on the TM-6 . . . grease twice a year. Most other 3/8-yd. machines have only 3 rollers, bushing-mounted.



Cast Steel Circle Gear

Center post and circle gear is heavy one-piece casting of alloy steel. Pinion gear is cut from alloy steel for smooth, quiet operation. Roller paths are machined to a smooth finish, top and bottom.

Write for 12-page booklet, "More Yardage through Air Power" which documents the operating and maintenance advantages of MICHIGAN air controls.

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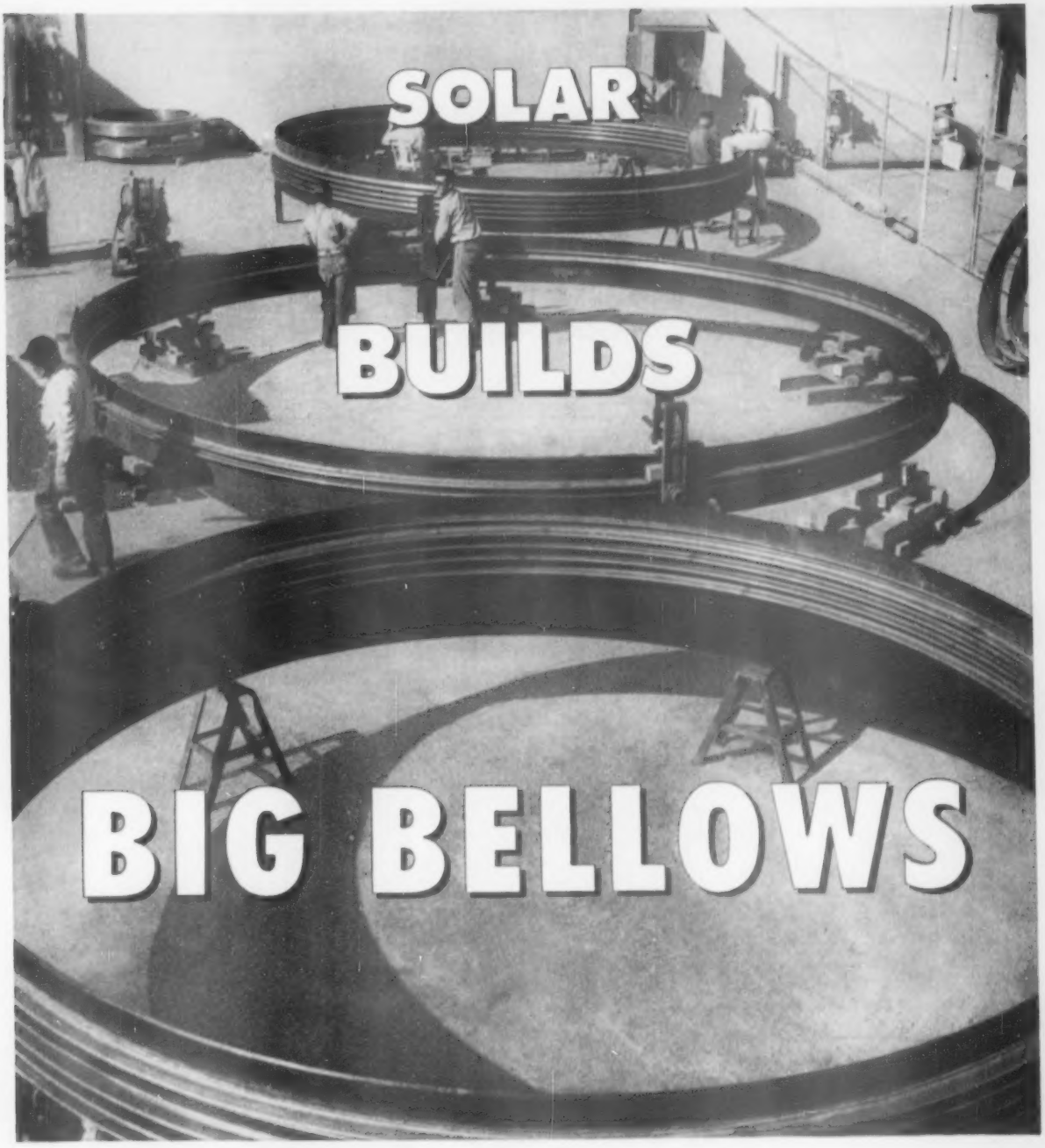
448 Second Street, Benton Harbor 31, Michigan
Phone: WA 6-6184



THE WORLD'S LARGEST EXPANSION JOINTS have been custom designed and built by Solar for a Midwest research facility. Thirteen stainless steel bellows, ranging from 5 to 28 feet in diameter, were made for this one project. The 28-foot joint—as tall as a three story building—is the largest metal bellows ever built. It required over 10,000 linear inches of flawless welding.

These giant bellows are only one example of Solar's versatile production of expansion joints. There are also small bellows units in standard pipe sizes down to ¾ inch for many applications. Further, Solar builds all major types of bellows—including convoluted for low pressure use and rugged U-span for heavy industrial needs.

In the petroleum, power, and many other industries, Solar bellows and expansion joints have been proven durable and economical. Both standard units and special designs are described in Sola-Flex catalogs. Experienced Solar engineering teams are available to help with unusual applications. Whether they call for giant expansion joints or tiny bellows—bring your problems of pressure and temperature to Solar. You'll get the right answer! Address Solar Aircraft Company, Dept. B-38, San Diego 12, California.

SOLAR AIRCRAFT COMPANY
SAN DIEGO
DES MOINES

DESIGNERS, DEVELOPERS AND MANUFACTURERS OF "Mars" and "Jupiter" Gas Turbine Engines and Power Units • Jet Engine Components and Afterburners • Sola-Flex® Bellows and Industrial Expansion Joints • Solaramic® Coatings for Metals • Custom-Engineered Aircraft Controls and Ducting Systems • Welding Fluxes • Exhaust Manifolds • Precision Fabrications of Titanium and All High Temperature Alloys.

FULL STOCKS AT J&L

AXELSON RODS

Many a man would wait as long as necessary for a string of Axelson Sucker Rods. There is no economical substitute for quality.

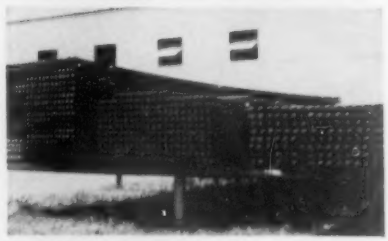
Rods normalized and heat treated from end to end *do* give better service.

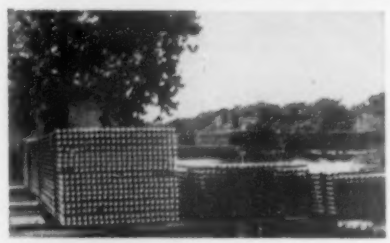
It *is* important for the grain of the steel to take the direction of the load.

Rod ends *can* and *do* give trouble unless designed with the skill Axelson concentrates on such important details. Each rod is individually checked at each end with "Go", "No-Go" and "Standoff", and profile gages.

A rod straight to the eye may have inherent kinks and bends. It's good to know that in every Axelson Rod this was forestalled with a Medart Straightener in the bar stage.

SO WE HAVE GOOD NEWS for countless producers in the United States and Canada: Immediate delivery and Axelson quality are now reunited. J&L stores can deliver from stock.

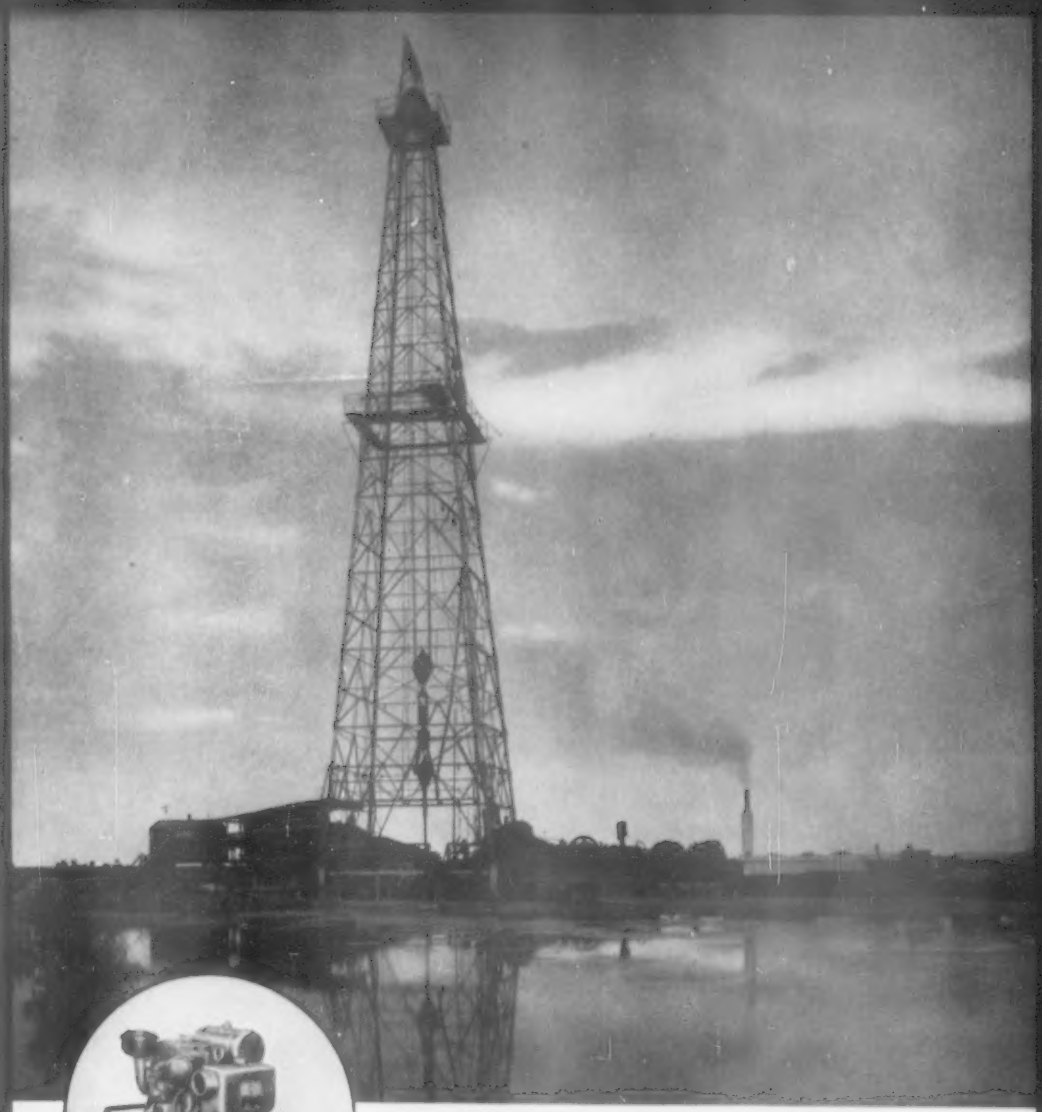


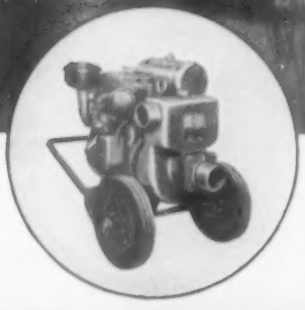


PESA
PARTNERS IN PETROLEUM PROGRESS

J&L STEEL

Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION—TULSA, OKLAHOMA
Serving The United States and Canada





Dawn to dusk or 'round the clock duty doesn't bother tool pushers who need dependable pumping. They're finding Marlow Self-Primers and Marlow "Mud Hog" Diaphragm Pumps are an important part of their job. For pumping wastes from cellars, or for washing down rigs, brake cooling service, and utility water supply, Marlows can't be beat!

marlows are durable!

Marlows are "old hands" at oil country pumping. They're built to handle the tough jobs in the field efficiently, day in and day out, with little attention and low maintenance. Known for their rugged dependability by majors and independents alike, more and more veteran oil men are making Marlows their *first choice!* Make sure with Marlow . . . get *all* the facts from your Marlow Dealer or write for Bulletin O-53.

MARLOW PUMPS • RIDGEWOOD, NEW JERSEY

There's not enough food for you and the bugs

As any backyard gardener knows, you have a fight on your hands from the moment you turn over your first spadeful of earth. At every step, fungus growths, weeds, and insects that chew, insects that suck are waiting to destroy your lawns, trees, plants, flowers. It is a disheartening struggle for Greenthumbers . . . a round-the-clock fight for commercial farmers.

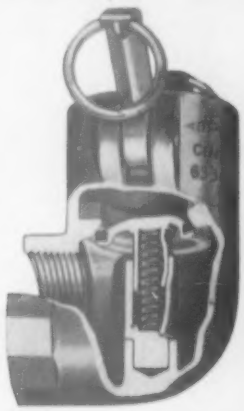
Fortunately, there's a growing list of weapons we now can wield in the battle against bugs. Some of the most effective have been developed in the laboratories of California Spray-Chemical Corporation, a Standard Oil Company of California subsidiary. In 1907, we brought out the first basic lead arsenate to stop the codling moth, a rampaging fruit crop destroyer; later, the invention of new-type summer and dormant oil sprays safely checked scale and other insects.

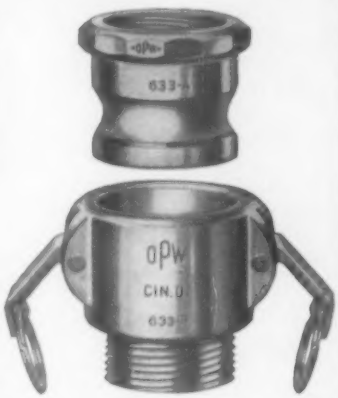
Other Standard research achievements have been chemicals to kill aphis, mites, thrips, and similar sucking insects . . . dusts to destroy fungus diseases like rust, blight, mildew...sprays and dusts custom-made to knock out such public enemies as the devastating grasshopper, boll weevil, hornworm. Other pest-killers boost milk production from our dairy herds, help beef cattle fatten faster.

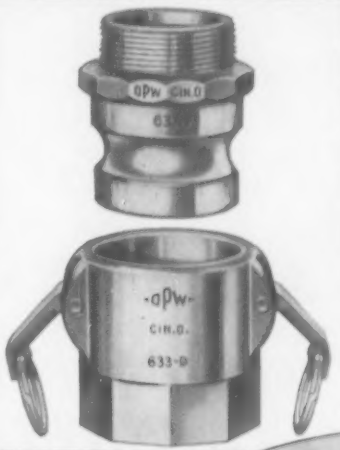
One good reason you live in the world's best-fed nation is because insect invaders have been held back on our farms, ranches, and orchards, thanks in part to Standard's constant hunt for new ways to make petroleum do more things for you.

STANDARD OIL COMPANY OF CALIFORNIA *plans ahead to serve you better*

KAMLOK COUPLING ASSEMBLIES







The Fastest Surest Coupling Known!

KAMLOKS positive seal all along the line assures *greater safety* in handling any type of liquid. A perfectly tight no leak connection is made in seconds by sliding coupler over adaptor, then pressing cam levers. No threads to engage, no twisting friction against gaskets, no tools required. KAMLOKS provide long years of economical trouble free service.

Available in any combination to meet coupling requirements in sizes from ¾" to 4" inclusive. Sizes ¾" through 4" of special hard wear-resistant bronze and OPALUMIN (hi-tensile aluminum alloy requiring no additional heat treating). 1" through 4" of monel. 1" and 2" (633A and 633B only) of stainless steel.

Parts A, E, F, are interchangeable with parts B, C, D, G, H, in the same size.

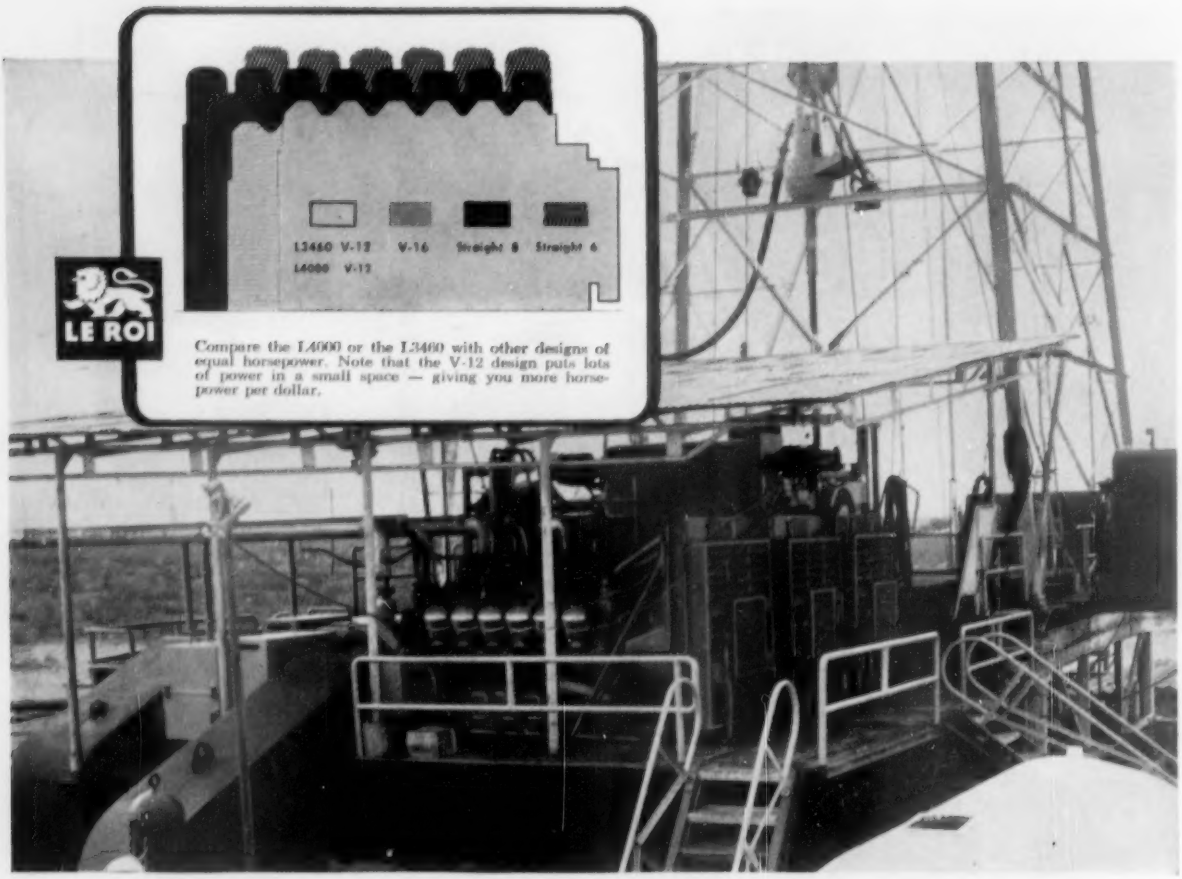
BRONZE • MONEL • ALUMINUM • STAINLESS STEEL

OPW CORPORATION

2731 COLERAIN AVE. • CINCINNATI 25, OHIO

FREE BULLETIN F-10 tells the complete KAMLOK story

OPW CORPORATION — FOR HANDLING HAZARDOUS LIQUIDS — OPW — VALVES - FITTINGS - ASSEMBLIES — CINCINNATI 25, OHIO



Compare the L4000 or the L3460 with other designs of equal horsepower. Note that the V-12 design puts lots of power in a small space — giving you more horsepower per dollar.

An engine doesn't have to be BIG to be POWERFUL!

The compact, V-12 design of Le Roi's L4000 and L3460 proves it!

Le Roi's L4000 and L3460 engines represent the first truly new design concept in 15 years. They are compact high-output engines, designed with short stroke to give you greater horsepower and speed without compromising engine life.

In addition to the advantages of short-stroke design, these modern V-12's have lightweight pistons, short-radius rotating parts — hydraulic tappets — crankshaft vibration dampener — sensitive controls. That's why they give you hair-trigger response to load demands.

The fuel economy of these engines is good, too. Thanks to advanced-design manifolding, low friction bearings, and low power loss to accessories, they give you rock-bottom fuel consumption.

Yes, big surprises come in small packages. That's especially true of the L4000 and L3460. These engines are conservatively rated to give you plenty of power in reserve. The L4000, for example, provides 655 max. hp. and the L3460, 600 max hp. And they have a wide speed range, too, up to 1350 rpm. That's why these engines are ideally suited to a great many oilfield applications: drilling, pipeline station, generator, gas booster, etc.

Engines may come bigger than these Le Roi's, but they sure don't come better! See for yourself — ask your supply house or Le Roi distributor to show you an L4000 or L3460 at work. Call him soon. Bulletins are also available — just write for them.

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 14, Wisconsin

PORTABLE AIR COMPRESSORS

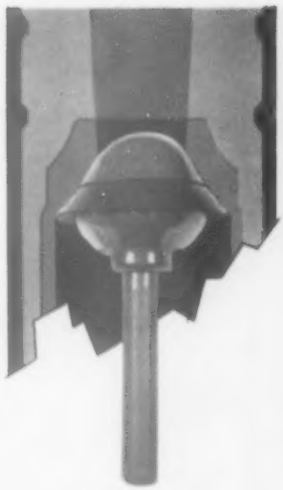
TRACTAIR

STATIONARY AIR COMPRESSORS

AIR TOOLS

ENGINES

ON "TOO TOUGH" JOBS SPECIFY *SUPER SEAL*



HALLIBURTON'S *PROVED* FLOATING EQUIPMENT

When high pressures and extreme depths make a cementing job "too tough" for conventional equipment, that's the time to specify Halliburton's Super Seal Floating Equipment. More leakproof, wearproof than any other, Super Seal was specially designed for fluid-tight service under the most extreme downhole conditions.

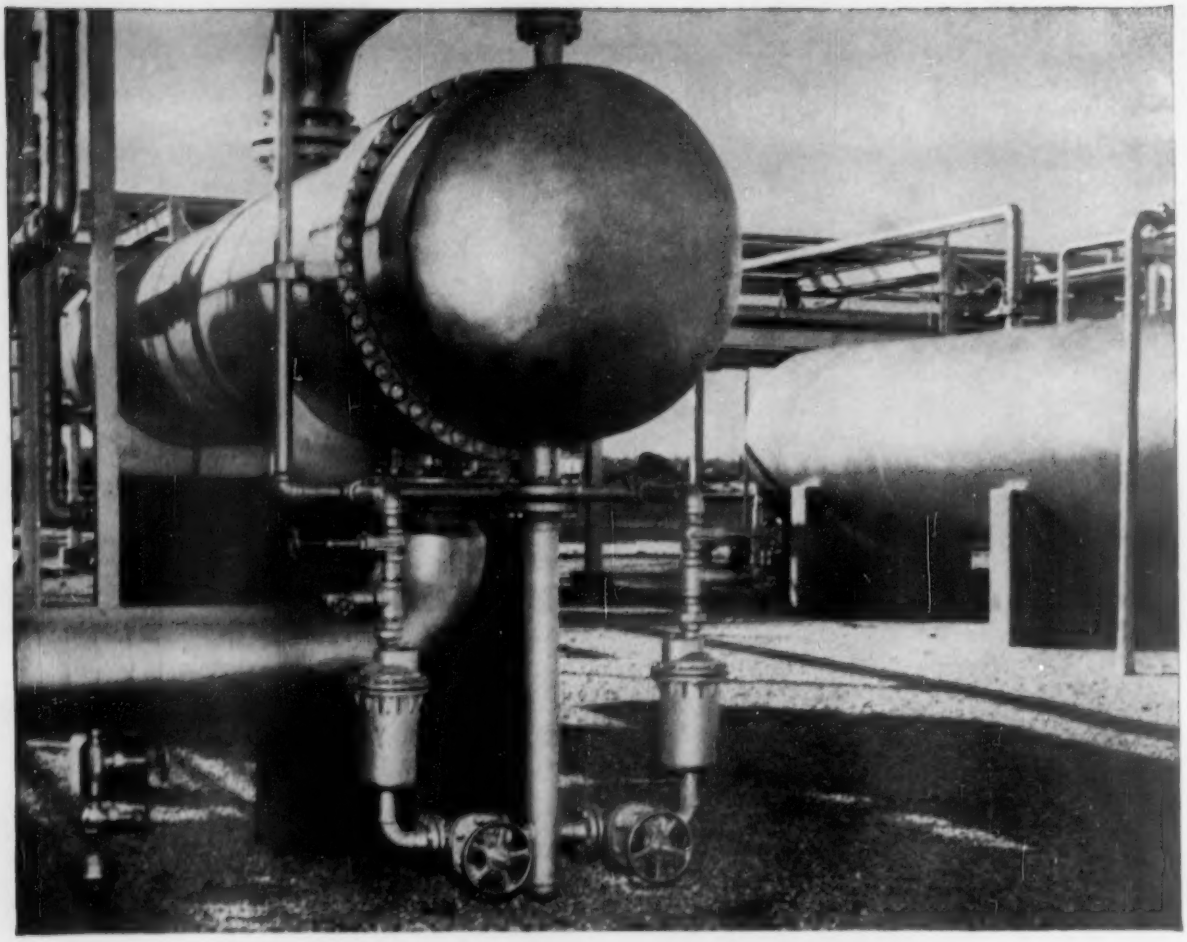
With a new *conical* valve that makes a solid *band* contact with its seat and a seal ring of oil-resistant rubber, the Super Seal valve gives greater protection against fluid contamination and extra tightness to hold cement outside casing. Back pressures of 1500 p.s.i. have been repeatedly introduced to the Super Seal valve after hours of continuous abuse by admix slurries. In every case, the results have been—no leakage, no fouling, no damaging wear and a perfect leakproof shut-off!

You receive all the advantages of extra protection combined with a safer guide design, a shock resistant concrete collar and faster drillability *only* with Halliburton's Super Seal Floating Equipment. For any job, rugged or routine, use the exclusive extras that can cut your completion costs with stronger, safer and more durable cementing. Call your local or district office of the Halliburton Oil Well Cementing Company.

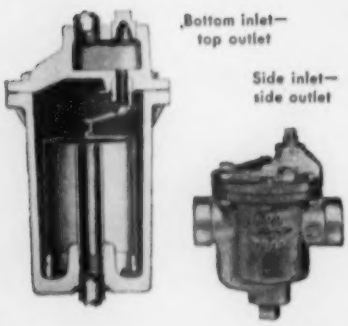
HALLIBURTON

CEMENTING EQUIPMENT

211 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG



A Look at Low Cost Maintenance . . .



Corrosion- and wear-resistant materials; "frictionless" leverage; precision workmanship — add up to LOW MAINTENANCE.

JUST a couple of steam traps stuck out in a cycling plant, along with a lot of valves and piping . . . that's what the picture shows. What the picture doesn't show is the big reason for the choice of those two Armstrong traps: *low cost maintenance.*

There is a tremendous investment in capital equipment riding on the performance of such small auxiliaries as steam traps. They have to work right 24 hours a day. Troublesome traps can eat up maintenance time like the desert can soak up water. That's why a photographer could work 'til doomsday without getting pictures of all the Armstrong traps in petroleum plants around the world. They've proved themselves on the maintenance score!

Only two moving parts . . . no sliding fits, no fixed pivots . . . file-hard chrome steel valve and seat . . . corrosion-resistant stainless mechanism . . . heavy reinforcement of wearing parts . . . generous safety margins . . . precision workmanship . . . factory testing of every trap — these are the things that pay off in long, long service life with infrequent maintenance. Ask your Armstrong Representative to show you the technical fine points that make such a big difference. Or, write:

ARMSTRONG MACHINE WORKS
868 Maple Street • Three Rivers, Michigan

Application Engineered

ARMSTRONG STEAM TRAPS

THE STEAM TRAP BOOK . . . Tells more about traps and trapping—44-pages of useful data free on request.

583

BRODERICK & BASCOM ANNOUNCES

NEW

YELLOW STRAND "POWERSTEEL" WIRE ROPE

Another addition to the famous Yellow Strand family — the new "POWERSTEEL!" Made of higher carbon content steel, new "POWERSTEEL" is 15% stronger, assures longer life. It withstands shock, resists wear. Preformed, with Independent Wire Rope Core, "POWERSTEEL" is a heavy-duty, crush-resistant rope, designed for long service.

STRONGER LONGER LIFE!

Yellow Strand "POWERSTEEL" was proved in military service in World War II. Its long life has been established on rugged logging operations. Broderick & Bascom is now presenting this higher quality rope to industry. Check on Yellow Strand "POWERSTEEL" for your tough jobs — where extra strength is needed. See your Broderick & Bascom distributor, or write the branch nearest you for information.

Yellow Strand®

BRODERICK & BASCOM ROPE CO.

4203 UNION BLVD. - ST. LOUIS 15, MO.

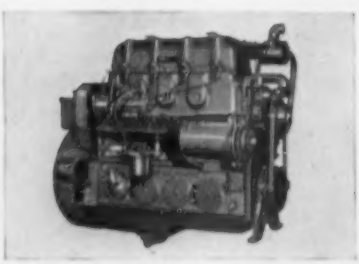
Manufacturers of Wire Rope for 79 Years

655 EDMUNDS ST. SEATTLE 8, WASH. | 270 NORTH STREET TETERBORO, N. J. | 1518 N.W. MARSHALL ST. PORTLAND 9, ORE. | 1330 W. FULTON ST. CHICAGO 7, ILL.

44 POTRERO AVE. SAN FRANCISCO 3, CALIF. | 2441 HUNTER ST. LOS ANGELES 21, CALIF. | 117 JEFFERSON HIGHWAY NEW ORLEANS, LA. | 9350 MARKET ST. ROAD HOUSTON 15, TEXAS

THE P&H DIESEL

how it kicked some old ideas in the teeth



Series C-18 P&H Diesels — now with *single*, fully self-contained fuel pump; perfect timing and balance for each cylinder. 30 to 255 horsepower, two-cycle. 2, 3, 4, 6-cylinder models, speeds up to 1800 r.p.m. Stationary, mobile, marine, diesel-generating sets.

Old idea: that diesels had just about reached the limit of efficiency. Then came the P&H — and a new high in horsepower per pound of engine weight.

Old idea: that diesels were costly by nature, $20.00 a horsepower and more. Then P&H drove the price down to a record low — $16.32.

Old idea: that horsepower ratings must always be tricky. P&H chose a new rating — horsepower measured right at the driveshaft, where every bit of it works for you.

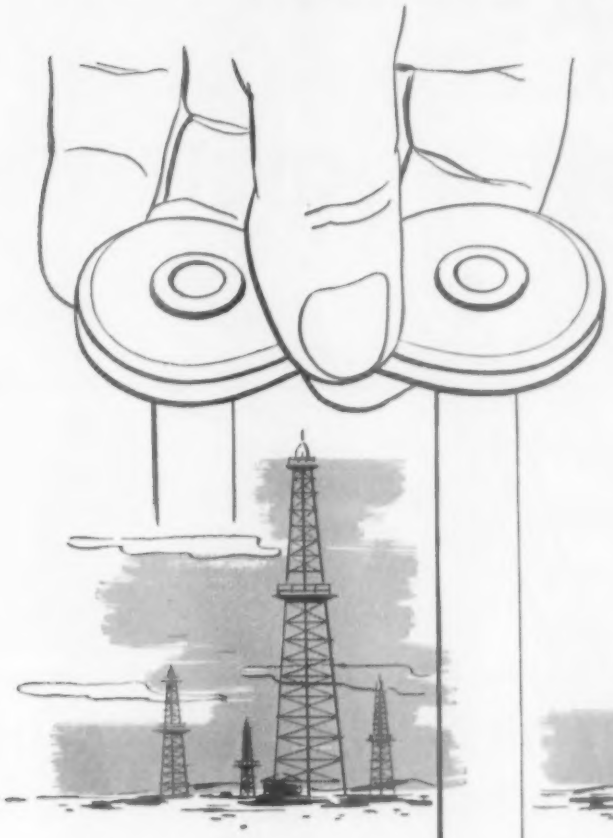
The best idea, of course, is to learn *all* the ways this engine gives you more for your money. We'll be glad to send you the full story; write P&H Diesel Engine Division, Harnischfeger Corporation, Crystal Lake, Illinois.

HARNISCHFEGER

the P&H *Line*

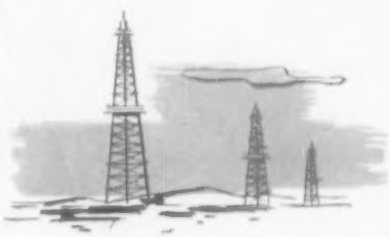
NOW YOU CAN HAVE...

EASY COUPLING–EASY UNCOUPLING



WITH FULL

CHAIN LIFE

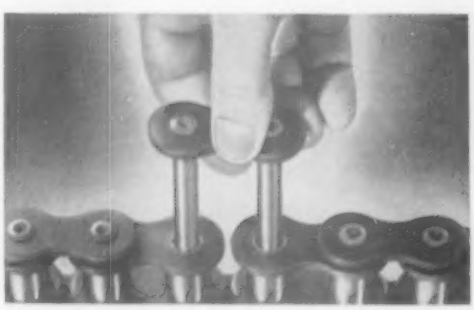


WITH REX OIL FIELD ROLLER CHAINS

Here's the oil field roller chain you've always wanted... easy to take apart... easy to couple ...but with a service life equal to, or better than, other roller chain.

To take this chain apart, you need only drive the pins the thickness of a single side plate. Then, you can pull the pins the rest of the way through the chain by hand... or by light tapping. It's just as easy to couple together.

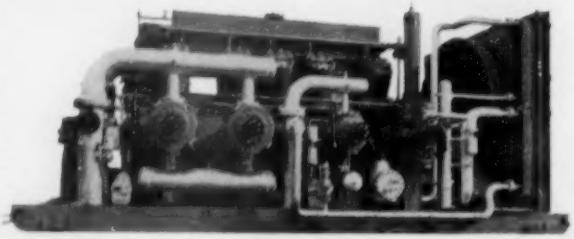
These desirable features are now possible without sacrificing the long-life features of heavy press fit chain. Investigate this chain for your needs, today. See your supply store or write for your copy of Bulletin No. 55-3. Chain Belt Company, 4619 W. Greenfield Avenue, Milwaukee 1, Wisconsin. Oil Field Offices: Dallas, Houston, Midland, Los Angeles, New York, Tulsa. Oil Field Warehouses: Dallas, Houston, Los Angeles.

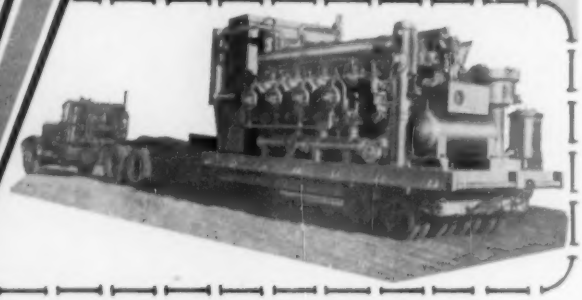


CHAIN BELT COMPANY

TAILOR MADE To Your GAS

S-R Packaged COMPRESSOR PLANTS





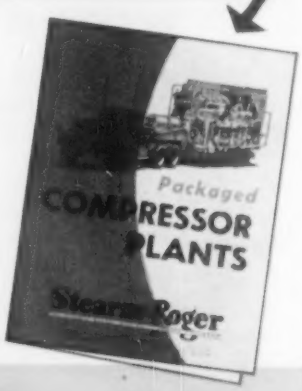
ONE Responsibility—from quotation to operation at your site gains you important advantages.

- Your choice of compressor and cooler
- Designed to suit your space requirements
- Engineered to handle your gas
- Complete instrumentation for safe, efficient, automatic operation
- Rugged compact unit construction
- Every important service—process engineering, custom fabrication, field erection

The combination of production plant facilities and long experience in gas engineering mean cost savings, prompt delivery, and lasting satisfaction.

DO YOU HAVE OUR BULLETIN: Packaged Compressor Plants?

It shows how Stearns-Roger designs for your specific problem of gas compression in units from 100 H.P. up, assembled for quick, simple installation and substantially automatic operation.



Take it up with Stearns-Roger

Stearns-Roger

THE STEARNS-ROGER MFG. CO. DENVER COLORADO

DENVER • HOUSTON • EL PASO • SALT LAKE CITY • *Stearns-Roger Engineering Company, Ltd., Calgary, Alberta*

THESE ADDITIVES ARE NOT ON THE PUMP BUT THEY TOO MEAN "PERFORMANCE"

Tenamene

EASTMAN GASOLINE ADDITIVES

Though unidentified at the point of final delivery, the presence of these additives is vital to the dependable performance of gasoline. For help in the careful selection and economical use of these gum-inhibiting additives, call on Eastman's highly qualified petroleum specialists.

For more information on Tenamene additives and the service that backs up their proper use, contact our local representative or write to Eastman Chemical Products, Inc., Kingsport, Tennessee—a subsidiary of Eastman Kodak Company.

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; New York—260 Madison Ave.; Framingham, Mass.—65 Concord St.; Cincinnati—Carew Tower; Cleveland—Terminal Tower Bldg.; Chicago—360 N. Michigan Ave.; St. Louis—Continental Bldg.; Houston—412 Main St. **West Coast: Wilson Meyer Co.,** San Francisco—333 Montgomery St.; Los Angeles—4800 District Blvd.; Portland—520 S. W. Sixth St.; Salt Lake City—73 S. Main St.; Seattle—821 Second Ave.

NORDSTROM
Rockwell-Nordstrom
LUBRICANT

Rockwell-Nordstrom Valves Prove Lubrication Is The Cheapest Maintenance!

● LUBRICATION ELIMINATES METAL-TO-METAL FRICTION

—the major source of valve wear. As in your automobile engine, lubrication assures longer life and better performance. Pressurized lubricant also forms a remarkably leakproof seal between the plug and the valve body. This lubricant seal has proven far more effective than the uncertain metal-to-metal seal in ordinary valves where a tiny scratch means leakage . . . and eventually, expensive reseating.

Costly valve down time is practically eliminated with Rockwell-Nordstrom valves because lubrication stops trouble before it starts. The lubricant also hydraulically jacks the plug to eliminate stuck or jammed valves, assures *instant*, quarter turn operation.

● LUBRICATION IS FAST...EASY

Rockwell-Nordstrom valves can be lubricated either with a pressure gun directly through the standard Rockwell fitting or by unscrewing the fitting and inserting lubricant "sticks." Lubrication never requires valve down time because any Rockwell-Nordstrom valve can be lubricated under service pressure.

Like any lubricated mechanism, frequency of use and operating conditions are the determining factors in the lubrication schedule. In any case, the time it takes to lubricate a Rockwell-Nordstrom valve is an investment in trouble-free, long-life valve service.

● LUBRICATION PENNIES SAVE MAINTENANCE DOLLARS

A few cents worth of lubricant buys three things: 1. *new seats* (renewing the lubricant is like reseating an ordinary valve) . . . 2. *smooth, dependable operation* and . . . 3. *savings* in terms of lower repair, replacement and down time expenses. It is not the cost of the lubricant that is important, but the *savings* through longer, more dependable life of the working parts and better performance.

● GENUINE ROCKWELL-NORDSTROM LUBRICANTS

are specially compounded to not only reduce friction, but also to create a positive, leakproof seal. They are the result of 40 years of production "know-how" and field testing by the pioneer lubricated plug valve manufacturer. Their sole purpose is to insure that Rockwell-Nordstrom valves give you the best valve service you've ever had. That's why it's good business to use *only* genuine Rockwell-Nordstrom lubricants in Rockwell-Nordstrom valves.

● 40 YEARS OF PERFORMANCE PROVE

that Rockwell-Nordstrom valves are the most economical valves you can buy for *any* service. Over the years, the sale of repair parts has been less than one-half of one per cent of Rockwell-Nordstrom valve total valve sales . . . *for every two dollars users spend on Rockwell-Nordstrom valves, they spend less than one penny for repairs.*

Whatever your needs, there is a Rockwell-Nordstrom valve that will do the job with more trouble-free dependability and at lower cost per year than any other valve you've ever used. And the first cost of Rockwell-Nordstrom valves is no more (and often less) than the cost of ordinary valves! For more information, write: Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Canadian Valve Licensee: Peacock Brothers Limited

ROCKWELL-Nordstrom VALVES

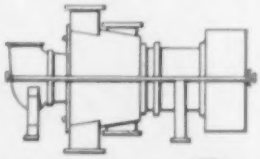
LUBRICANT SEALED FOR POSITIVE SHUT-OFF

FACTS on Westinghouse 5000-hp gas turbines . . .

5000 hp on a 7′ x 38′ foundation

Westinghouse gas turbines give you the most compact packages of power. • The foundation in the building for the 5000-hp unit is only 7′ x 38′ and this includes the gas compressor. • Turbines are vibration-free—only a light foundation is required. • Because of their smaller size and lighter weight, you save construction costs. • Heaviest piece to be handled during installation is 25 tons. • Heaviest piece to be handled afterward is 3¼ tons.

For more information, see your Westinghouse sales engineer, *The Man With The Facts*, or write for booklet B-5859. Westinghouse Electric Corporation, 3 Gateway Center, Pittsburgh 30, Pennsylvania. J-50583



YOU CAN BE SURE...IF IT'S Westinghouse

Now...your own painter can "COLD-GALVANIZE" any steel surface with DIMETCOTE

* the 100% inorganic zinc coating

any **PLACE**

any **TIME**

any **WHERE**

SPRAY *or* **BRUSH**

Dimetcote is absolutely unique. It is not a paint, it contains no oils, resins or any other organic materials, yet it can be applied by spray or brush. When Dimetcote is applied to steel, a reaction takes place at the surface which produces chemical bonding as well as physical adhesion. It is almost impossible to find the interface between Dimetcote and the steel.

Dimetcote has many unusual characteristics. It shows no visible change after more than ten years exposure to the most severe weather conditions – sun, heat, fresh and salt water. It is insoluble in all solvents and petroleum products. It is highly abrasion resistant, but if abraded through to bare steel, the coating will cathodically inhibit corrosion.

Now tanks and structures can be given the same protection that galvanizing affords, *plus salt water resistance.* Existing structures need not be dismantled and new structures can be coated either before or after erection. *Only one coat* of Dimetcote over a sandblasted surface is required to protect such structures as:

Tank Exteriors • Cargo Tanks in Tankers • Dam Gates • Structural Steel • Christmas Trees • Buoys • Floating Roof Tanks • Offshore Rigs • Water Tanks • Barges • Ship Decks • Stacks

Write for the Dimetcote Technical Bulletin today.

Follow the line of MOST resistance: Amercoat® CORPORATION

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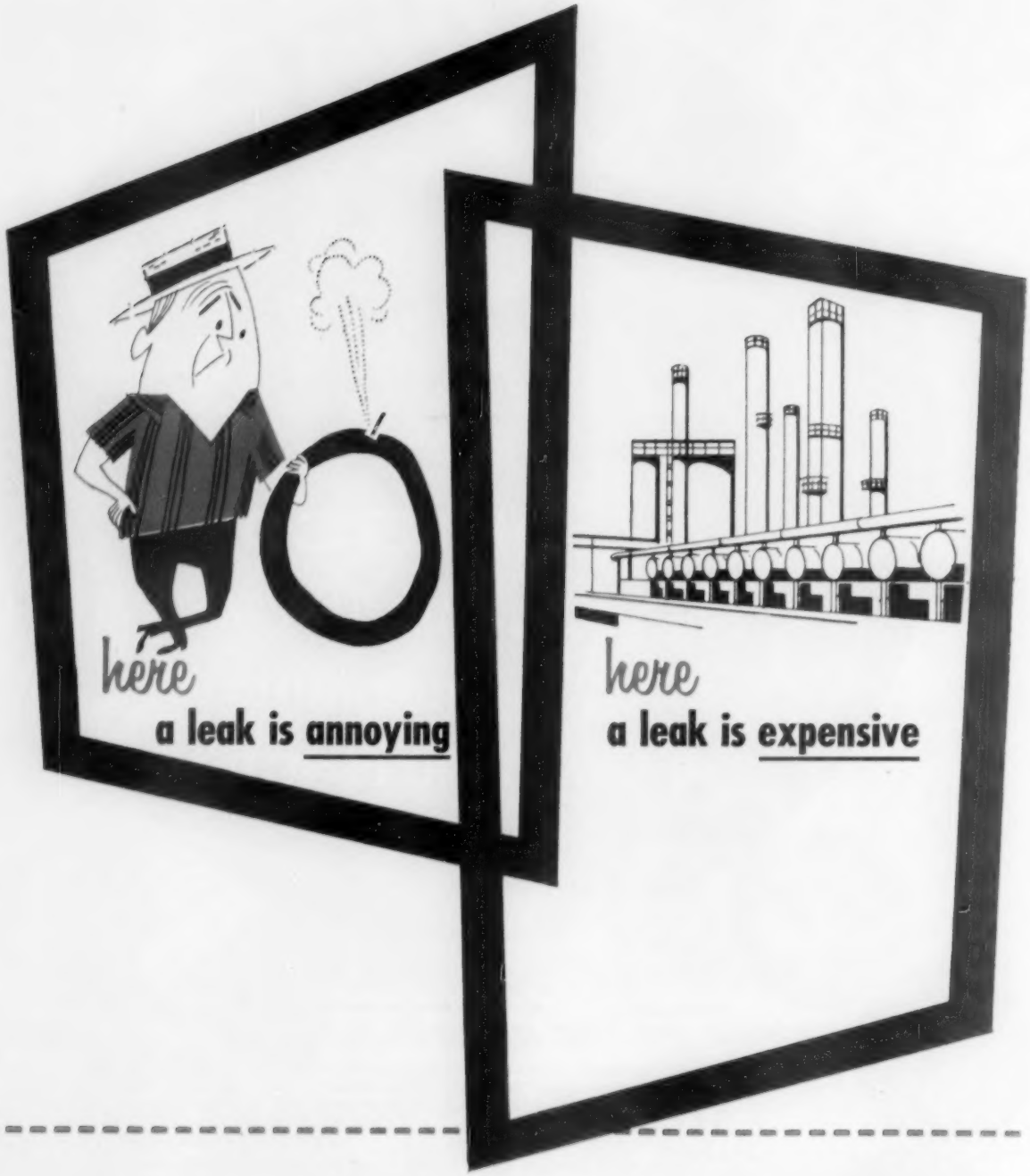

IT PAYS TO LOOK AT THE ADVANTAGES OF USING B&W SEAMLESS WELDING FITTINGS

Welded Construction Assures Minimum Pressure Loss — True circularity and radii, and smooth inner walls reduce friction and turbulence.

Welded Construction is Easily Insulated — The smooth external surface simplifies insulation . . . and it is maintenance free.

Whole Sections Can Be Shop-Fabricated — Ease of fabrication permits entire sections to be shop-fabricated and installed in a few minutes.

Welded Construction is Simple to Install — Dimensional accuracy of angles, radii, and bevels, assures quick and easy joining.

Welded Construction Takes Less Space — Piping can be nested in corners, or fitted against ceilings, walls or equipment.

Welded Construction is Lightweight — Strength combined with lightness-in-weight permits easy handling.

District Sales Offices: BEAVER FALLS, PA. • BOSTON 16, MASS. • CHICAGO 3, ILL. • CINCINNATI 6, OHIO • CLEVELAND 14, OHIO • DETROIT 26, MICH. • HOUSTON 19, TEX.

DESIGN FOR PERMANENCE WITH B&W SEAMLESS WELDING FITTINGS

Comparison proves the practicality of using B&W Seamless Welding Fittings in a piping system.

Uniformly machined bevel ends, and true dimensional accuracy of B&W Welding Fittings assure quick and positive fit-up to pipe. Note the smooth unbroken inner wall of the welded joint. There are no pockets or crevises to interrupt smooth flow and cause an eventual failure. Combined with the strength of a sound weld, this permits a piping system to be permanently leakproof and maintenance free.

here's how B&W SEAMLESS ALLOY WELDING FITTINGS KEEP PIPELINES PERMANENTLY LEAKPROOF AND MAINTENANCE-FREE!

In welded construction, using welding fittings, the strength of the weld approaches that of the pipe itself, making such piping safe and dependable.

Maintenance problems of a flanged assembly, such as caulking, gasket replacement, bolt tightening, etc. are non-existent. Thousands of dollars can be saved on maintenance alone during the normal service life of a welded piping layout.

THE *NATURAL* SOURCE FOR ALLOY FITTINGS

B&W SEAMLESS WELDING FITTINGS

GRADES:
Carbon, Alloy and Stainless Steel

TYPES:
Elbows, Tees, Caps, Saddles, Laterals, Nipples, Returns, Flanges, Stub Ends, Reducers, Crosses, Bull Plugs

SIZES:
Complete range of sizes and schedules

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION • FITTINGS DEPARTMENT
3839 WEST BURNHAM STREET • MILWAUKEE 46, WISCONSIN

FA-5911

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AVAILABLE JOHNSTON by AL CAPP

HELP!!
GRAMPAW JUST FELL IN THE WELL, BLESS HIS CREAKY OLD BONES!!
DON'T WORRY!!—HERE WE ARE—"AVAILABLE", AND "ACCURATE"—THE JOHNSTON BOYS—WITH OUR JOHNSTON JAR!!—
THEY KNOCKED GRAMPAW LOOSE!! NOW, THEY'RE FISHING HIM OUT WITH THAT JOHNSTON JAR!!
IT DOES BOTH JOBS!!
IT HIT WITH JUST THE RIGHT FORCE, TO LOOSEN HIM WITHOUT HURTING HIM!!—
THOSE JOHNSTON BOYS ARE AVAILABLE FOR ANY TESTING JOB —AND THEY DO IT SO ACCURATELY!
Al Capp

C-544

Copr. Capp Enterprises 1954

JOHNSTON TESTERS

first in drill stem testing

HOUSTON, TEXAS

LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON

Hardened, Honed Seats

for tough throttling service

Fig. No. 558, bronze globe valve, 200 lbs. WSP, @ 550°F., 400 lbs. WOG, non-shock

A plug-disc and seat so hard they can crush scale between them and still close tight. A stem that absolutely will not gall or seize. The combination is in a rugged bronze valve designed for tough throttling service . . . the OIC 558!

Both plug-disc and seat are stainless steel, heat-treated to more than 500 Brinell hardness. Their seating surfaces are ground and *honed* to an accurate, smooth, bearing finish. The stem is OIC *alloy-40*, a sturdy bronze which won't gall or seize.

Remember, in throttling service a valve's stem, plug-disc and seat must withstand the most abusive wear. Rely on the toughness designed into this OIC line to give you extra-long service. Specify the modern 558 where you need bronze globe valves for throttling.

Write for Form No. 1001 which describes this valve along with the entire OIC 500 line, including composition disc and spherical disc globes, angles and check valves.

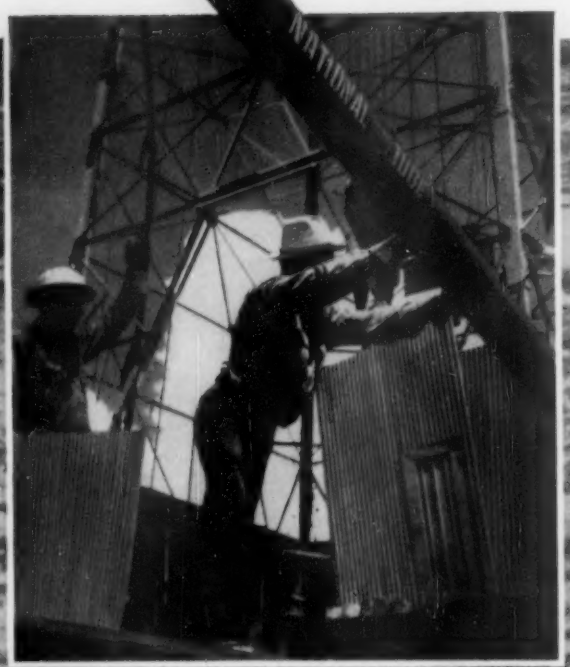
Call your OIC Distributor.

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

VALVES | **FORGED & CAST STEEL, BRONZE & IRON, LUBRICATED PLUG VALVES**

Another Record-Breaker for Deepest producer on

does the job



WALLS WITHOUT WELDS

All National Drill Pipe, Casing, and Tubing is pierced from solid billets of high quality steel — the one manufacturing method that assures absolutely uniform wall strength.

NATIONAL SEAMLESS...

Grande Ecaille Dome

with NATIONAL Drill Pipe, Casing, and Tubing

The L.L.&E. #1, a 16,281-foot John W. Mecom-Freeport Sulphur Well in Lake Washington Field, Plaquemines Parish, Louisiana, is the deepest producer on the Grande Ecaille Dome. On a four-hour production test, the well flowed at the rate of 405 barrels of 48-9-gravity condensate daily through a small choke. It made gas at the rate of 1,325,000 cubic feet.

NATIONAL Seamless Drill Pipe was used in drilling the new well to a depth of 16,281 feet, before completion was made. The combination casing string consisted of 5700 feet of 7-inch O.D. NATIONAL (B) Buttress-Thread Casing, 9300 feet of 7-inch O.D. NATIONAL Deep Well Casing, and 1425 feet of NATIONAL N-80 Liner. The 16,257 feet of tubing were NATIONAL Seamless. All tubing in the hole passed Loomis testing during running.

NATIONAL Seamless Oil Country Tubular Products are habitually chosen for the *deep* hole jobs because they promise trouble-free dependability all the way down—even under the most rigorous conditions. The Seamless process of manufacture gives them unsurpassed uniformity and strength, the best defense against fatigue, twisting action, and collapse.

Look at these National Tube developments for the Oil Industry:

NATIONAL DEOXIDIZED BESSEMER STEEL CASING AND TUBING...GRADES H-40, J-55
Especially well-suited for oil production because of its combination of high yield strength and good ductility.

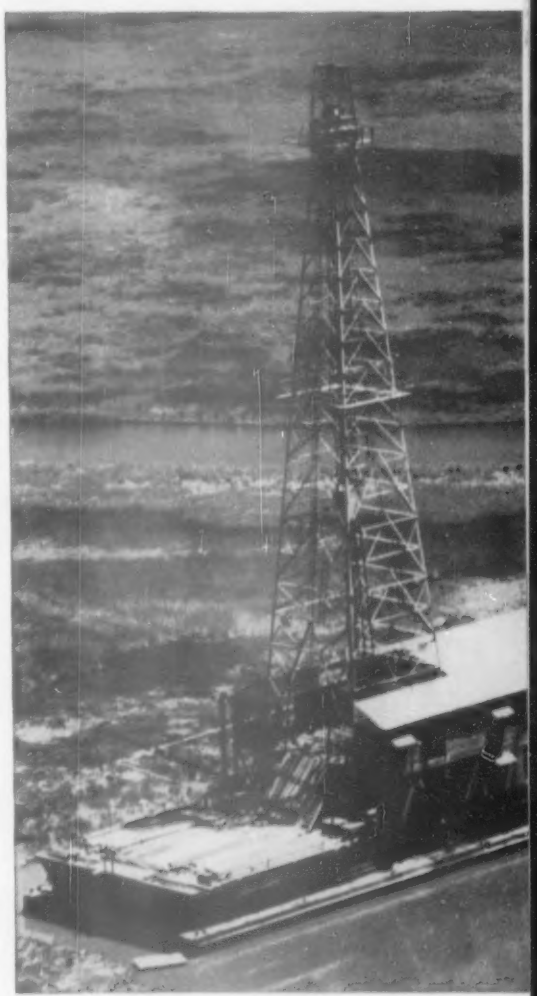
NATIONAL WARM-WORKED CASING . . . GRADE N-80
An extremely high strength casing possessing a uniformity of physical properties which gives it high collapse resistance and greatly increased joint strength, hydrostatically tested to 80% of minimum yield strength up to a maximum of 10,000 p.s.i.

NATIONAL DEEP-WELL CASING
A stronger casing than is provided under A.P.I. specifications, to meet constantly increasing depths. Because it is intended for severe service it is hydrostatically tested to 80% of minimum yield strength up to a maximum of 12,000 p.s.i.

NATIONAL (B) BUTTRESS THREAD-CASING
Developed to satisfy the need for a casing joint which will safely and economically support the weight of deep-well casing. The buttress-thread joint is comparable in strength to that of the body of the pipe.

For complete details on NATIONAL *Seamless Drill Pipe, Casing and Tubing, write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.*

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



SEE The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

NATIONAL (USS) SEAMLESS

DRILL PIPE . . . CASING . . . TUBING

UNITED STATES STEEL

Why is Dunham Tanks forging ahead?

(NO. 7 IN A SERIES OF 10 ADS.)

New, Advanced Horizontal HP Oil & Gas Separator

better because..

In the space of only one short year, Dunham's new advanced Horizontal High Pressure Oil and Gas Separator has become a leader in oil field production equipment. This separator has more than proven its efficiency of operation.

Reasons:

- **modern, exacting designs**
- **inlet diverter**
- **multiplate primary extractor**
- **wire mesh secondary extractor**
- **extra large liquid capacity**

Next time you buy, give your nearest Dunham sales engineer a call. He'll show you how to save money and achieve greater profits with Dunham Tank's modern, progressive oil field production equipment.

ANDERSON-DUNHAM, INC. DUNHAM TANKS TANK DIVISION

ST *IN OIL FIELD PRODUCTION EQUIPMENT*

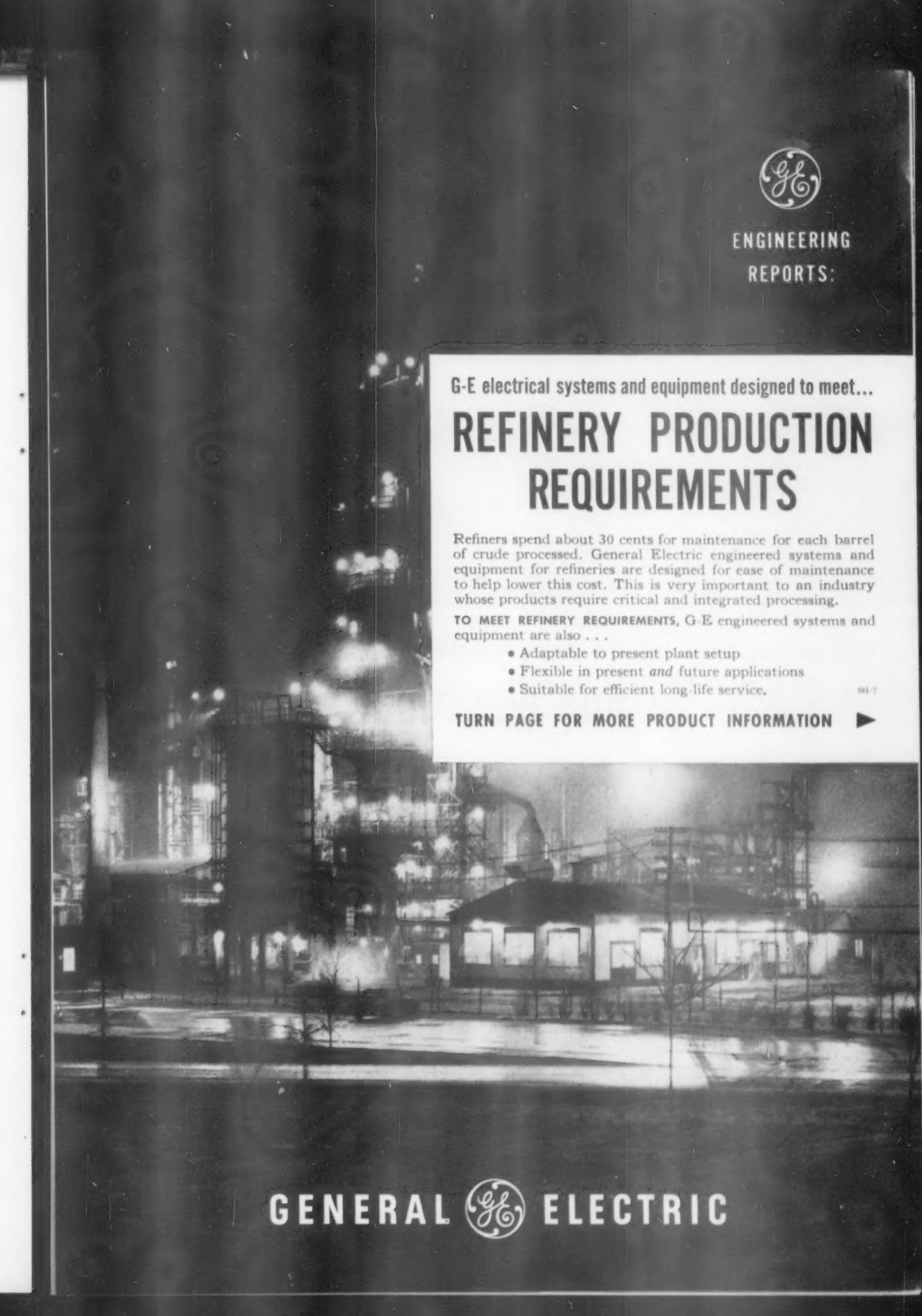
DUNHAM TANKS

Division of Anderson-Dunham, Inc., Baton Rouge, La.

Products:

Welded and Bolted Steel Tanks, Steel Stairways and Walkways, Vertical and Horizontal Oil & Gas Separators, Emulsion Heaters and Treaters, Indirect Gas Heaters, Cold Separation Units, Two Stage Separation Units, Gas Dehydration Units, Three Phase Separators, Free Water Knockout, Servel Refrigeration Units and LeRoi Compression Units.

Plant: Minden, La. Sales and Service: Shreveport, La.; New Orleans, La.; Lafayette, La.; Perry, Okla.; Seminole, Okla.; Tulsa, Okla.; Ardmore, Okla.; Odessa, Tex.; Corpus Christi, Tex. (Lester Moore Tank & Supply Co.); Houston, Tex.; and, Natchez, Miss.



ENGINEERING
REPORTS:

G-E electrical systems and equipment designed to meet...

REFINERY PRODUCTION REQUIREMENTS

Refiners spend about 30 cents for maintenance for each barrel of crude processed. General Electric engineered systems and equipment for refineries are designed for ease of maintenance to help lower this cost. This is very important to an industry whose products require critical and integrated processing.

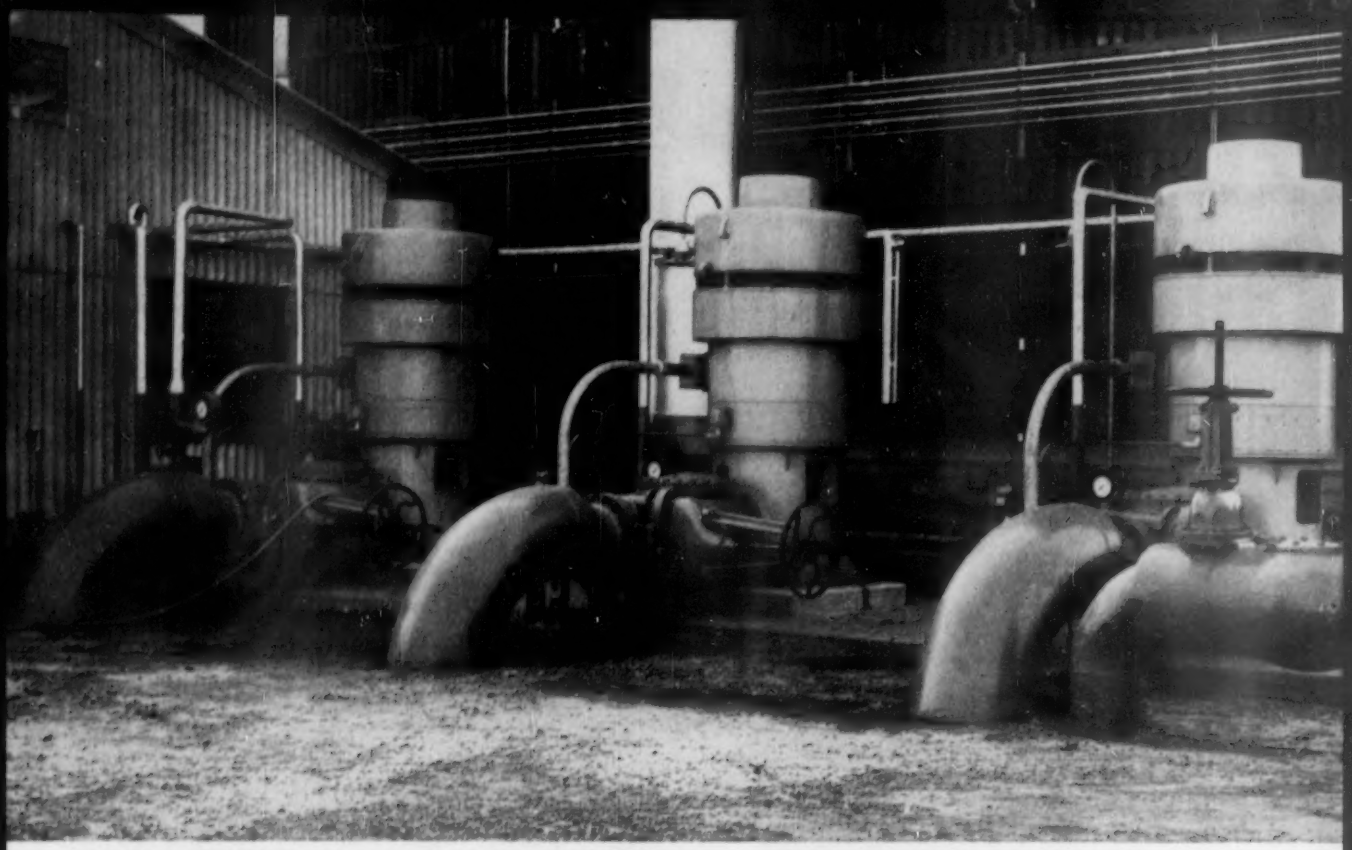
TO MEET REFINERY REQUIREMENTS, G-E engineered systems and equipment are also . . .

- Adaptable to present plant setup
- Flexible in present *and* future applications
- Suitable for efficient long-life service.

661-7

TURN PAGE FOR MORE PRODUCT INFORMATION ►

GENERAL ELECTRIC



SEVERAL AVAILABLE TYPES of protective enclosures make G-E motors ideal for all indoor or outdoor uses. New Polyex insulation

G-E ENGINEERED DRIVES AND POWER SYSTEMS MEAN . . .

Modern, flexible electrical systems for

IN THE NEXT TEN YEARS, production must increase an estimated 50% to meet greater consumer needs. Available manpower will increase only an estimated 14% during the same period.

INCREASED OUTPUT AND EFFICIENCY must close the production gap between available manpower and estimated demand. General Electric electrical systems are designed and installed for efficient, flexible, easily expanded production.

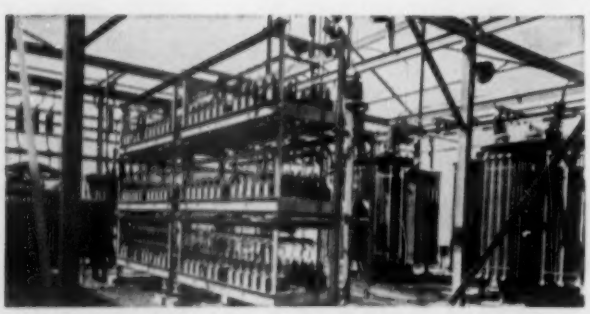
G-E ENGINEERING SERVICES (see back page) can help you meet production requirements to bring your electrical system up to date. The result is a modern system integrated into your present plant setup.

FOR ADDITIONAL INFORMATION on how G-E engineered systems and engineering services can help you, contact your G-E Apparatus Sales Representative during your early planning at the nearest G-E Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y.

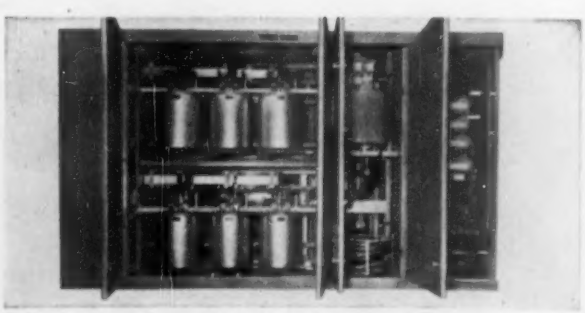
681-5

Engineered Electrical Systems for Process Industries

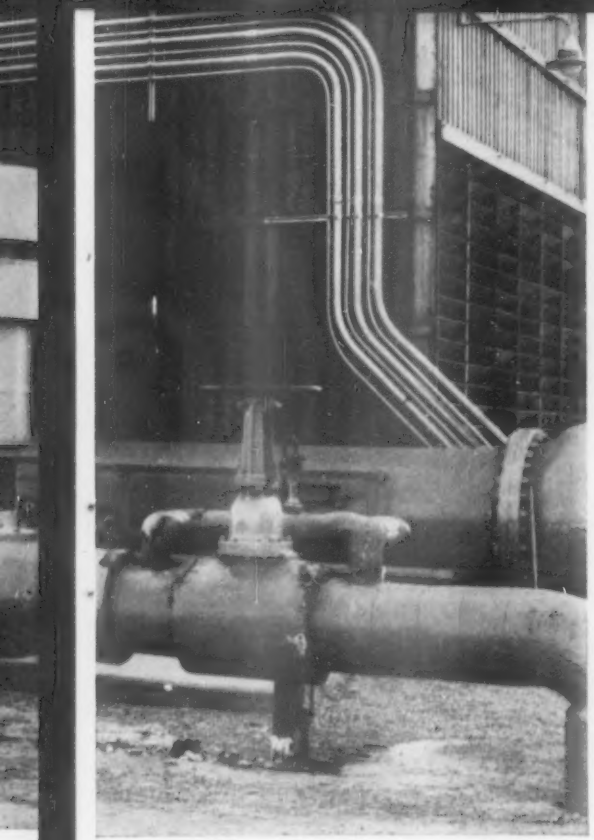
GENERAL ELECTRIC



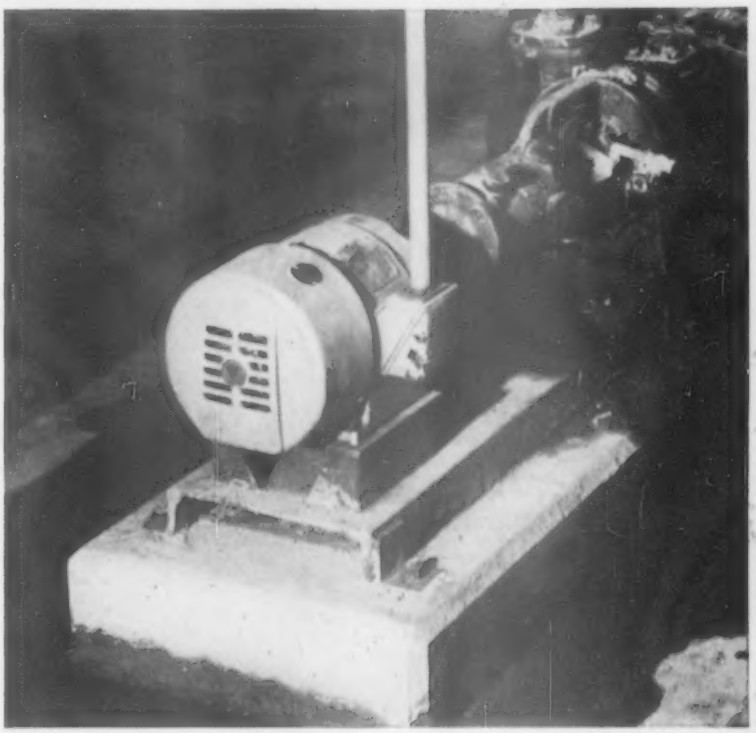
"BUILDING-BLOCK" design of this stack-rack capacitor block reduces installation costs. This design means equipment may easily be expanded or moved to meet plant requirements.



HIGH EFFICIENCY and low installation cost of this pumpless rectifier provide more reliable and economical d-c power. Factory wired, the unit is ready when it arrives to connect and operate.



gives up to 50% longer motor life.



NEW G-E TRI-CLAD® '55' MOTORS, totally enclosed, are suitable for damp areas, even where hosing is necessary. New cooling system cleans while it cools motor.

your process lines

G-E MAGNETIC STARTERS and safety switches are compact, for maximum space savings. Short-circuit protection is provided by circuit breaker or fusible disconnect switch.

CORROSIVE ATMOSPHERE effects are greatly minimized in these G-E Tri-Clad induction motors. Rugged cast-iron construction makes them excellent for process application.

SHORT CIRCUIT PROTECTION up to 60,000 amps, plus 50% greater space savings are provided by all-new G-E Limitamp®.

*Reg. Trademark of General Electric Company

SIX G-E ENGINEERING SERVICES . . .

HELP YOU PROTECT YOUR EQUIPMENT INVESTMENT

1 **G-E APPLICATION ENGINEERING** helps you and your consultants design the right electric system for your plant.

2 **G-E ANALYTICAL ENGINEERING** helps attain the optimum electrical system for your application. Engineering experience backed up by electronic system analyzers save valuable design time.

3 **G-E PRODUCT DEVELOPMENT** laboratories design and test new equipment under tomorrow's conditions to meet your future demands.

4 **G-E FIELD-SERVICE ENGINEERING** helps you supervise installation, expedite start-up of your major electric equipment.

5 **G-E MAINTENANCE SERVICE** from 36 G-E Service Shops will repair and uprate your old equipment, help establish productive maintenance of your equipment, furnish emergency service.

6 **G-E PROJECT CO-ORDINATION** means on-time engineering, shipment, installation of your electric equipment from preliminary diagrams through start-up.

These valuable services are available to you with General Electric equipment. Contact any General Electric Apparatus Sales Office. Meanwhile, for the full story of G-E engineering services, write for brochure GED-2244, General Electric Co., Section 681-5, Schenectady 5, N. Y.

Progress Is Our Most Important Product

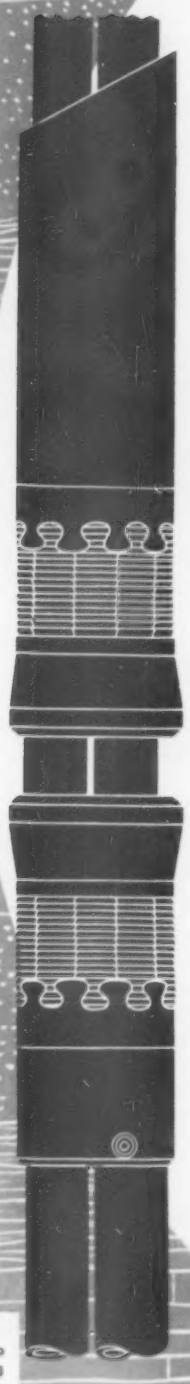
GENERAL ELECTRIC

BROWN

SOS Detachable

DUAL STRING PACKER

NEW – SIMPLE IN DESIGN AND OPERATION – RETRIEVABLE, ECONOMICAL – ELIMINATES EXTRA EQUIPMENT – SETS AUTOMATICALLY, NEEDS NO SURFACE MANIPULATION OR TUBING WEIGHT



(Picture shows two 2" tubing strings in 7" pipe.)

1. Each tubing string is run or pulled separately – without the usual dual string clamps, and extra handling equipment – thus saving considerable time and money.
2. Permits PERMANENT COMPLETION of lower zones – full opening string with minimum or no tubing weight.
3. Eliminates possibility of complicated fishing operations.
4. The Detachable String Packer is run in with one string (with stinger below for lower zone packer), then the second string is run independently and automatically latches into and packs off in the packer without rotation. The 45° concave surface at top of packer simply guides this string into place. To release this string only right hand rotation is required.

Advantages of Dual String Installations

- Leave mud in casing annulus with no pressure existing other than hydrostatic head of mud column.
- Handle both zones separately at all times so they are never thrown together.
- Install sub-surface controls in both strings so they may be serviced separately.
- Be able to swab, treat or pump either zone separately without interfering with production from the other.

For further information, write: Brown Oil Tools, Inc.

BROWN OIL TOOLS, INC.
2214 CAMPBELL ST.
HOUSTON, TEXAS

a 20-year project lets you

SET IT and FORGET IT

advances in MM engine design keep pace with oil industry's greater performance demands

To *set* power and *forget* it demands superior on-the-job serviceability *and* service.

Minneapolis-Moline *serviceability* means super long-run dependability . . . a 20-year improvement project that has kept pace with stepped-up performance requirements of the oil industry.

Months and years of continuous unattended operation on oil field pumping jobs attest to the success of MM's exclusive maintenance-saving design. Part size, weight and displacement of MM engines increases with h.p. Cylinder blocks and heads are cast in removable pairs separate from the crankcase to simplify service and renewal. Crankcases have extra depth below center line of crankshaft for greater rigidity and bearing support, offer metered vacuum ventilation for longer lube oil life. Thermo-clad protection with bypass cooling and water-blanketed base pans provide complete temperature control.

In addition to MM long-run advantages, you cut operating costs with SECO flat-rate contract maintenance. Compare this SECO flat-rate service contract with your present service charges for hourly pay, mileage, etc., and see how maintenance costs go down. Exclusive MM SECO service by Shrimpton offers a complete engineering, installation and maintenance program that means you can literally "set it and forget it". Discover the big, two-way savings you can make with long-run MM engines serviced by SECO. Contact your MM oilfield distributor for the facts.

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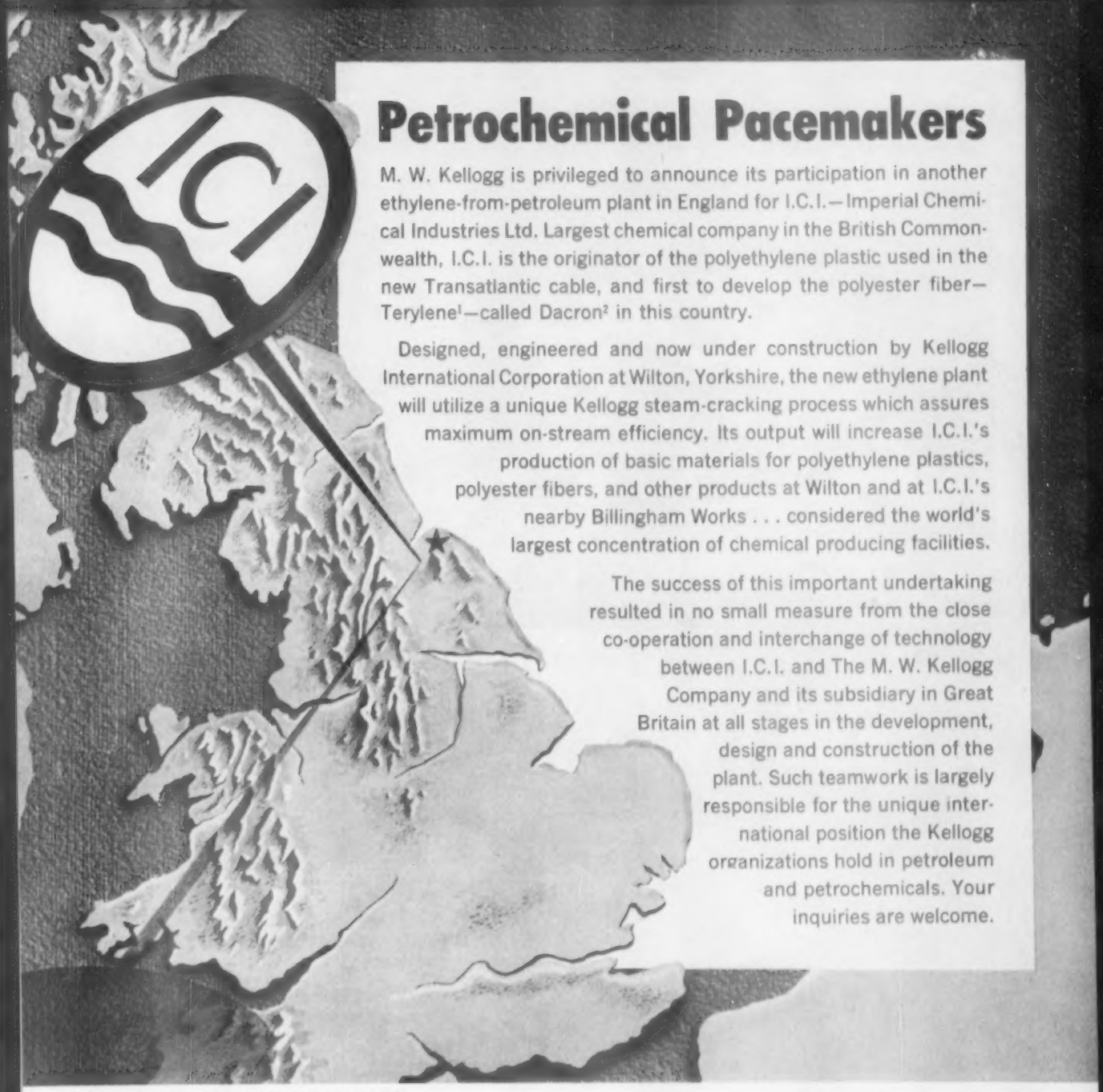


Petrochemical Pacemakers

M. W. Kellogg is privileged to announce its participation in another ethylene-from-petroleum plant in England for I.C.I.—Imperial Chemical Industries Ltd. Largest chemical company in the British Commonwealth, I.C.I. is the originator of the polyethylene plastic used in the new Transatlantic cable, and first to develop the polyester fiber—Terylene[1]—called Dacron[2] in this country.

Designed, engineered and now under construction by Kellogg International Corporation at Wilton, Yorkshire, the new ethylene plant will utilize a unique Kellogg steam-cracking process which assures maximum on-stream efficiency. Its output will increase I.C.I.'s production of basic materials for polyethylene plastics, polyester fibers, and other products at Wilton and at I.C.I.'s nearby Billingham Works . . . considered the world's largest concentration of chemical producing facilities.

The success of this important undertaking resulted in no small measure from the close co-operation and interchange of technology between I.C.I. and The M. W. Kellogg Company and its subsidiary in Great Britain at all stages in the development, design and construction of the plant. Such teamwork is largely responsible for the unique international position the Kellogg organizations hold in petroleum and petrochemicals. Your inquiries are welcome.

[1] *Registered Trademark of Imperial Chemical Industries Ltd.*

[2] *Registered Trademark of E. I. DuPont de Nemours & Co., Inc.*

M.W. Kellogg

ENGINEERING FOR TOMORROW

THE M. W. KELLOGG COMPANY, NEW YORK 7, N. Y.

The Canadian Kellogg Company, Limited, Toronto • Kellogg International Corporation, London

SUBSIDIARIES OF PULLMAN INCORPORATED

Otis – First In Pressure Control
FIRST IN THE PETROLEUM INDUSTRY
Running and Pulling Tubing and Drill Pipe Under Pressure

They Say—

"Cooking on the Front Burner"
Reprinted from the Chicago Sun-Times

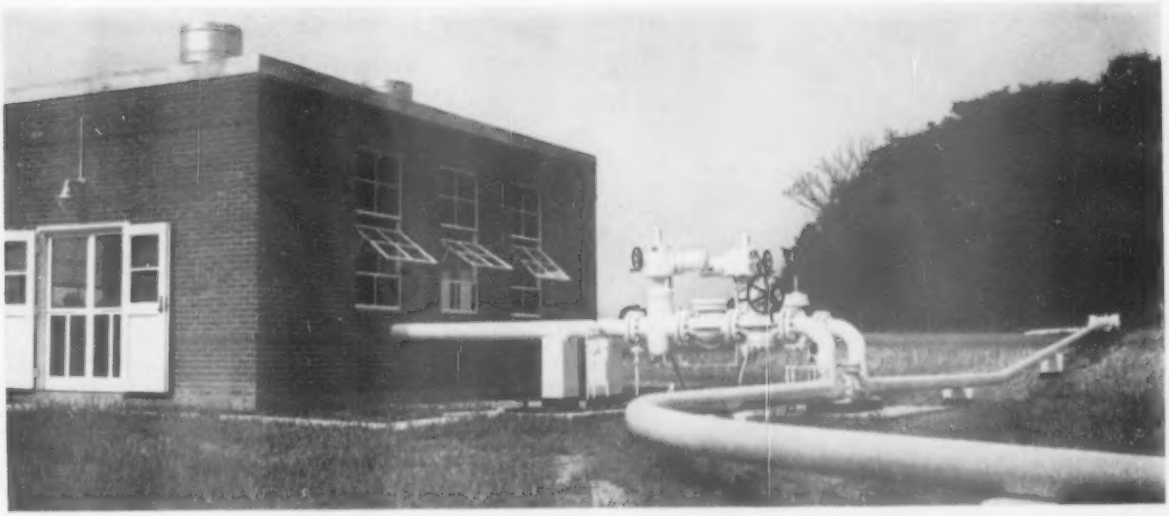
Views From a Consuming Area

"For many years it was assumed that Congress should no more set the price at which gas should be sold at the well than it should regulate the price of coal, iron, etc., at the mine. Such prices in this country always have been set by the play of supply, demand, and competition at the market place . . .

"The city of Chicago, through Asst. Corp. Counsel Joseph F. Grossman, has opposed the bill (to exempt natural-gas producers from federal control). Grossman claims that consumers must be protected against price increases and says the responsibility for gas price increases in Chicago in recent years must be borne primarily by unregulated producers. Senator Douglas (D-Ill.) also opposes the bill. We favor it.

"Competition works to keep prices low at the wellhead just as competition works to keep any price low. Without controls, retail-gas prices nationally went up only 8 per cent from 1938 to 1953. According to Dr. Robert E. Wilson, board chairman of Standard Oil of Indiana, gas has gone up far less than other fuel and 'is the biggest bargain in this category' . . .

"Regulation of gas producers for conservation purposes long has been left up to the states. Federal regulation, besides being, as Wilson says, a step toward socialism, would substantially interfere with sound state regulatory measures covering production, pricing, etc. We believe consumers will be better off if Congress passes H.R. 6645 to restore free enterprise in the field



This Illinois pumping station is controlled by a man in Radio City

When dialed, the pumping station automatically sends its meter readings via teletypewriter to the dispatcher in New York.

Shell Oil Company's automatic pipeline pumping station in Dennison, Ill., is supervised and controlled over Bell System lines from an ordinary telephone dial in New York City—more than 800 miles distant!

For meter readings, Shell's dispatcher in New York's Radio City dials a number. Back on the teletypewriter from the Dennison station come suction and discharge pressures and motor current readings.

He dials other numbers to start or stop the pump, open or close valves or to summon an attendant.

This remote-control system keeps the pipeline—which carries 22 different finished petroleum products—operating smoothly from one central location. Dennison is only one of four similarly controlled pumping stations on the line.

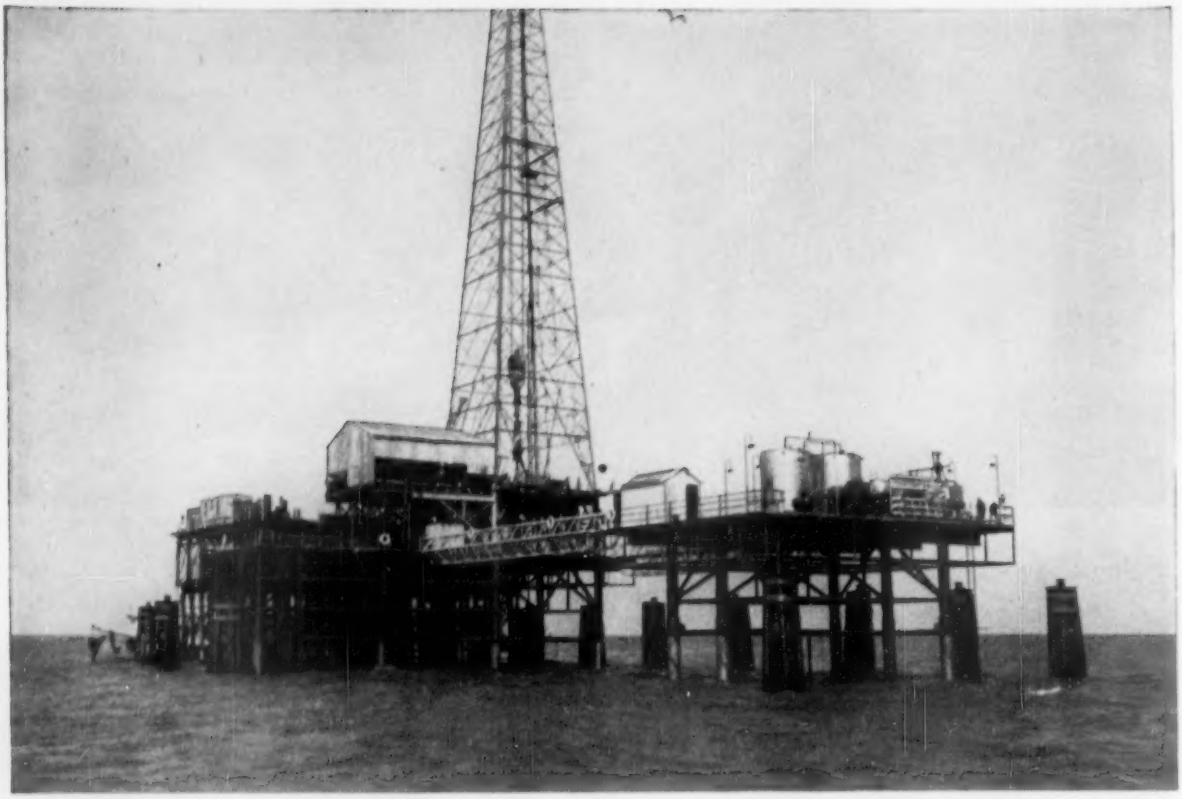
Using Bell System communications, you get the benefit of new developments without tieing up capital.

We supply the pipeline industry with reliable private line telephone and teletypewriter service, maintain mobile radio facilities and provide channels for telemetering and supervisory control.

Bell System communications engineers will be glad to survey your communications needs without charge. Call your Bell Telephone representative today.

BELL TELEPHONE SYSTEM

TELEPHONE TELETYPEWRITER MOBILE RADIO TELEMETERING AND REMOTE CONTROL CHANNELS



Prevent corrosion damage to offshore structures, by sheathing them with Monel in the critical zone where tide, waves and spray attack continuously. Piling on this structure were sheathed with Monel for a height of 6 feet.

Protect your offshore structures against corrosion . . .

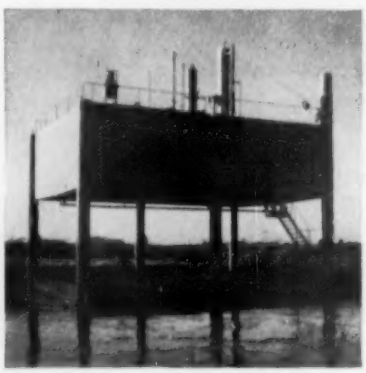
Use Monel in critical splash zone

When it comes to maintenance of piling on offshore structures, the tidal and splash zone is the "critical zone." Below it, cathodic protection takes care of corrosion prevention; above it, satisfactory coatings of paints and other organic compounds can be applied.

But in the zone which is intermittently wetted by tides, swells and spray it takes a sheathing of corrosion-resistant metal to do the job.

On drilling platforms, loading docks, well head protector platforms and the like, experience shows that Monel sheathing provides excellent protection. It does so for three primary reasons:

1. **It resists corrosion by salt water, air and spray.**
2. **It has good mechanical properties — it is a tough, strong alloy which is welded right to the steel structure.**
3. **It is easily fabricated, applied and welded.**



Protect Mobile Units, too. Monel sheet protects the 20-inch columns of this tank battery barge, in the tide and splash zone. Columns are sheathed for 6 feet with 18 gauge Monel sheet, using "140" Monel welding electrodes.

Monel sheathing may be applied both to new structures and to those already in the water. Corrosion-resistant all the way through, it can be specified in thicknesses to meet both fabricating and service demands. For full particulars write to Mr. C. J. Brown, Inco Nickel Alloys Dept., The International Nickel Company, Inc., 67 Wall Street, New York 5, New York.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO Nickel Alloys

Monel ... *for minimum maintenance*

and to exempt independent producers from control."

Editorial in Chicago Daily Sun-Times.

Jersey and Imports

"We believe that this program (of voluntarily restricting imports to the same level as 1954) will place Jersey in the position of conforming with the current policy expressions of the Government on the subject of oil imports.

"It is to be hoped that voluntary action of importing companies, as suggested in the cabinet committee report, will result in the satisfactory solution of the oil-import problem since, in our opinion, legislative or administrative restrictions on oil imports would eventually cause harm to the oil industry and our national economy. . . ."

M. J. Rathbone, president, Standard Oil Co. (N.J.), at the company's annual meeting.

Venezuelan Left Out

Dear Sir:

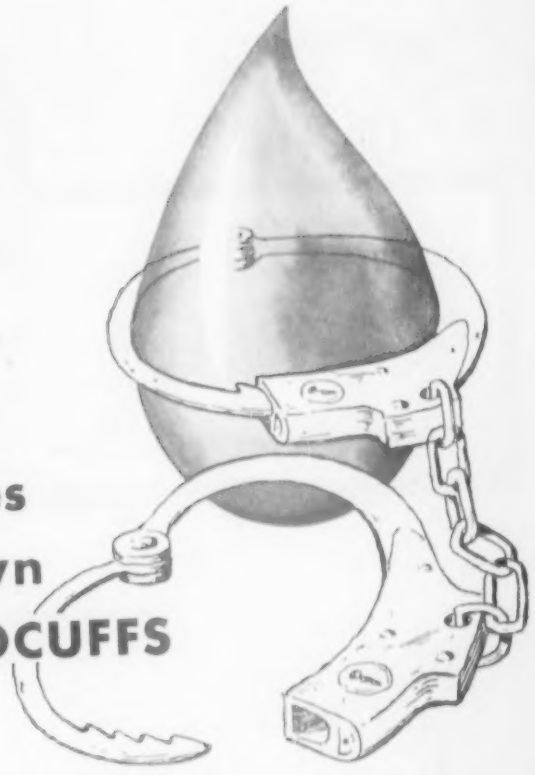
I have read with interest your recent article concerning independents going abroad *(The Oil and Gas Journal, May 30, page 46)* . . . Although our company is not very large among the independents, we feel that we have made great strides in the last 39 months.

Although we have operated in Venezuela where no new concessions have become available for the past 10 years, we have made important strides, both productionwise and acreagewise. I thought you might like to have a little run-down on our operations, as you probably know I have been dabbling in foreign oil since as early as 1940 and was the founder of Manabi Exploration Co. of Ecuador.

Talon Petroleum, C.A. took over the operations of the old British Controlled Oilfields, Ltd., in Western Venezuela on December 1, 1952. At that time we had a daily production of 920 bbl. We now have this figure up to 2,000 bbl. per day. We have gone in with new methods and a better interpretation of the general geology and have found virgin sands below the old producing horizons which were mainly located at the La Puerta and Agua Clara unconformity. The new sands are below the unconformity. Incidentally, we are the first independent in the country to obtain new production in some 25 years.

When we took over from British Controlled Oilfields, we had a total amount of 7,000 acres . . . Since then we have made a deal with Cia. Espanola de Petroleos, S.A., of Madrid, Spain, and have taken over all of their concession holdings in Western Venezuela. This amounted to approximately 25,000 acres . . . We have on application bids for new concessions, if and

Flood water often carries its own HANDCUFFS



● All too often, flood water takes with it into the earth the means of its own strangulation—the invisible handcuffs which will gradually but surely slow or halt the drive. In nearly every part of the oil country, the experience of many water flood projects proves that this is not theory but crippling fact.

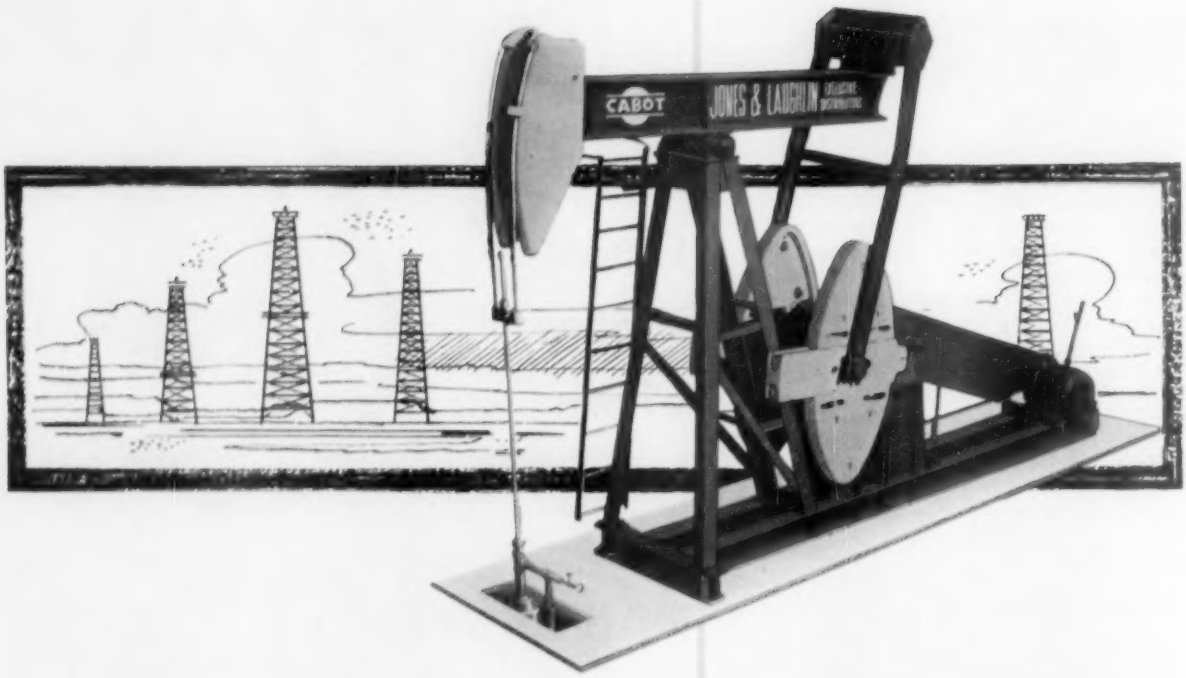
● Settling, sedimentation and conventional filtration only partially remove from the injection water the algae, bacteria (particularly the sulfate-reducing bacteria) and some of the precipitants which have been identified as major causes of formation plugging. But diatomite filtration unlocks the "handcuffs" from injection water, because its "sharp" filtration traps and removes even bacteria and other colloidal solids. The trouble-free experience of many flood projects now using diatomite filtration is convincing evidence of its effectiveness, particularly in the cases where diatomite-filtration flood projects are operating close to other projects which use conventional clarification methods and whose injection pressures continue to rise, month after month.

● Other advantages of diatomite filtration are the smaller space requirements (about 1/5 that of sand filter systems), the lower installation costs, and the mobility of diatomite systems, some of which are completely unitized.

For more complete information, write

Dependable GLC GREAT LAKES Dicalite® DIATOMACEOUS MATERIALS

DICALITE DIVISION GREAT LAKES CARBON CORP., 612 S. FLOWER ST., LOS ANGELES 17, CALIF.



Cabot's 20,000th Pumping Unit

Is 20,000 a big number? Not compared to the national debt, but a pretty substantial number when you're considering precision equipment that does a vital job. Perhaps you will permit us just a little pride when we point to this 20,000th Cabot pumping unit which comes off of our assembly line this month. The 25 years that have gone into the development of this unit have been rewarding . . . not just because our endeavor has been successful, but we feel that it has made a real contribution to the petroleum industry. Now we are dedicated to keep the Cabot pumping unit a leader in the industry.

Cabot Shops . . . Pampa, Texas . . . 1938

Cabot Shops . . . Pampa, Texas . . . 1955

CABOT

CABOT SHOPS, INC.
PAMPA, TEXAS

FRANKS TULSA, OKLAHOMA,
A DIVISION OF CABOT SHOPS, INC.

this ___ __
_ _____ is

"Tuffy Nuff"

SEE PAGE 117

when they are let by the Venezuelan Government . . .

Incidentally, our crude is one of the most desirable in Western Venezuela, having a very low sulfur content.

The owners of Talon Petroleum are as follows: Clint W. Murchison, Sr., of Dallas, 50 per cent; and the balance owned by Roy B. Kelly, a Washington attorney; George L. Ohrstrom, an investment man from New York City; and myself. . . .

Cecil V. Hagen
Talon Petroleum, C.A.
Maracaibo, Venezuela

CALENDAR

JULY

20-22 Instituto Tecnologico y de Estudios Superiores de Monterrey, first annual short course on instrumentation for industry, campus, Monterrey, N. L., Mexico.

AUGUST

15-16 North Dakota Oil and Gas Association, annual meeting, Bismarck, N. D.

15-17 Society of Automotive Engineers, golden anniversary West Coast meeting, Hotel Multnomah, Portland, Ore.

29-31 15th annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

26-Sept. 15 Graduate summer session in reservoir engineering, University of Texas, Austin.

SEPTEMBER

2-3 Association of Desk and Derrick Clubs of North America, fourth annual convention, Commodore Hotel, New York City.

11-13 Independent Natural Gas Association of America, annual meeting, Jasper Park Lodge, Jasper Park, Jasper, Alberta, Canada.

12-14 American Institute of Electrical Engineers, electrical conference of the petroleum industry, Shamrock Hotel, Houston.

12-16 Tenth National Instrument Conference and Exhibit, Los Angeles, Calif.

12-16 Second International Instrument Congress and Exposition and tenth National Instrument Conference and Exhibit, Shrine Auditorium, Los Angeles.

14-16 National Petroleum Association, 53rd annual meeting, Traymore Hotel, Atlantic City, N. J.

14-17 American Association of Petroleum Geologists, western Canada regional meeting and fifth annual field conference of Alberta Society of Petroleum Geologists, Jasper, Alberta, Canada.

22-23 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

22-23 Louisiana - Arkansas Division, Mid-Continent Oil and Gas Association, annual membership meeting, Roosevelt Hotel, New Orleans.

26-28 American Association of Oilwell Drilling Contractors, fifteenth annual meeting, Rice Hotel, Houston.

26-28 American Institute of Chemical Engineers, fall national meeting, Lake Placid Club, Lake Placid, N. Y.

29 Natural Gasoline Association of

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HOW TO REDUCE MAINTENANCE COSTS

This simple method is one which many of the largest Oil Companies are already using. They know that the protection of large surface areas against corrosion — and the risk of plant out of action — is a heavy charge against maintenance. They know, too, that the only way to keep this charge to a minimum is to cut down the frequency of repainting by using paint that lasts longer.

International paints are made specially for the Oil Industry by the world's largest paint organisation. Because they are tailored for the job . . . . because they give better protection, International paints definitely last longer and reduce maintenance costs.

With 23 factories throughout the world, International are always on the spot. Order a test sample today.

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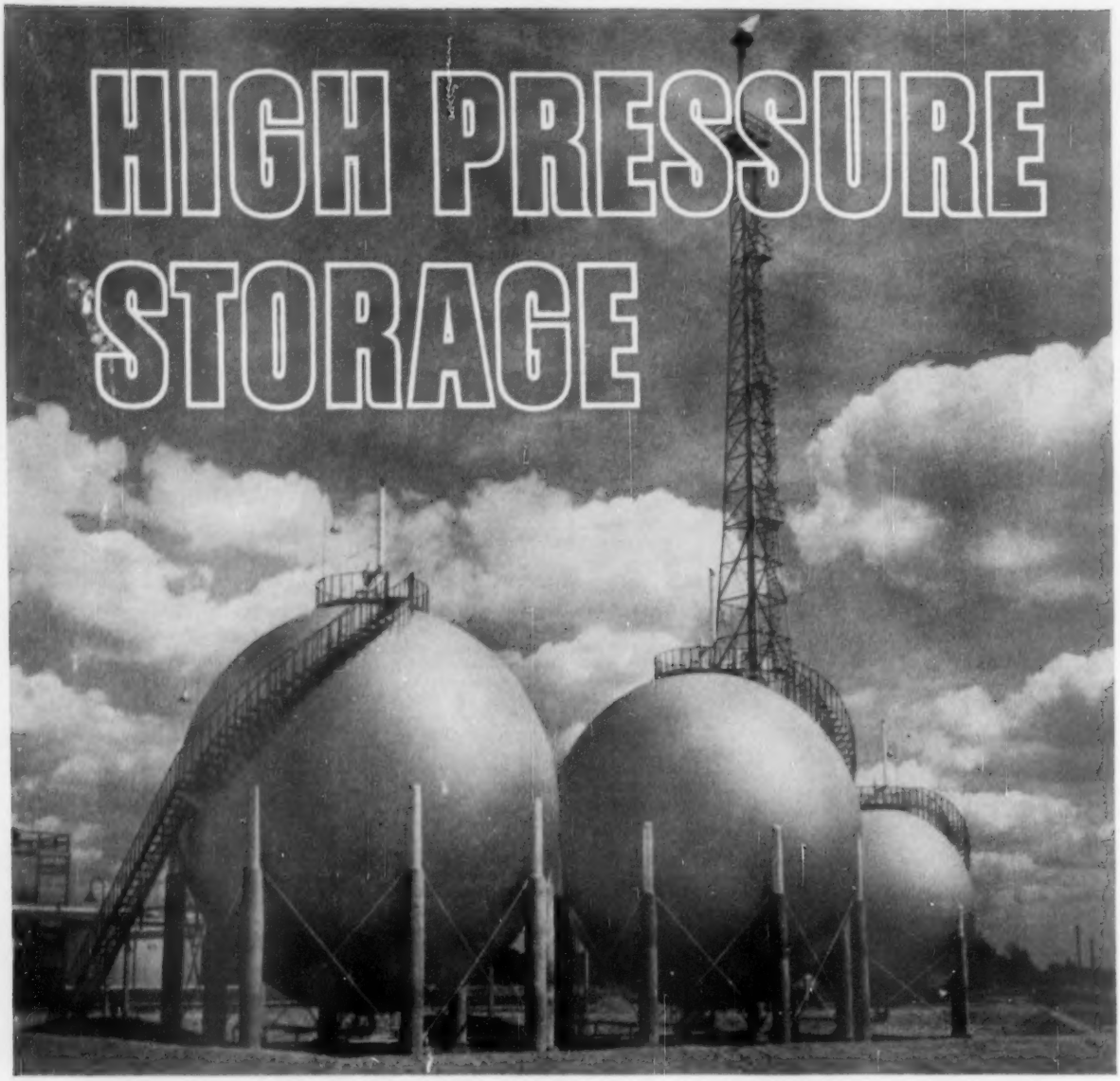
LONDON: INTERNATIONAL PAINTS (EXPORTS) LTD., GROSVENOR GARDENS HOUSE, LONDON.



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For pressure storage of process butane, iso-butane, natural gasoline and other volatile liquids and gases, Graverspheres are a "natural."

Graverspheres are formed in Graver shops and are first carefully assembled to insure accurate fit. After this they are shipped to location, erected and field-welded.

These spheres—the very shape of which is ideal for high-pressure storage in quantity—are available in capacities from 1,000 to 30,000 bbl. For gas storage Graverspheres are made to withstand pressures up to 100 p.s.i.g. and for liquid storage from 20 to 90 lb. water pressure.

As is the case with Graver tanks, towers and pressure vessels, traditional Graver quality and craftsmanship are inherent in Graverspheres.

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GRAVER builds tanks, towers and pressure vessels for the chemical and petroleum industries

America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

OCTOBER

2-5 American Institute of Mining and Metallurgical Engineers, Petroleum Branch, fall meeting, Roosevelt Hotel, New Orleans.

2-6 American Society for Testing Materials, Committee D-2, petroleum products and lubricants, Statler Hotel, Washington, D. C.

3-4 Texas Mid-Continent Oil and Gas Association, 36th annual meeting, Baker Hotel, Dallas.

3-6 Rocky Mountain Association of Petroleum Geologists and Denver Geophysical Society, 25th annual meeting, Denver.

9-15 American Petroleum Institute, Oil Progress Week.

12-14 Gulf Coast Association of Geological Societies, annual meeting, Buena Vista Hotel, Biloxi, Miss.

12-14 Gas Appliance Manufacturers Association, El Mirador, Palm Springs, Calif.

12-14 National Association of Corrosion Engineers, sixth biennial Permian basin tour, Lincoln Hotel, Odessa, Tex.

13-14 California Natural Gasoline Association, annual fall meeting, Ambassador Hotel, Los Angeles.

14 American Institute of Chemical Engineers, South Texas Section, 10th annual technical meeting, Galvez Hotel, Galveston, Tex.

17-19 American Gas Association and Pacific Coast Gas Association, annual meeting, Ambassador, Biltmore, and Statler Hotels, Los Angeles.

18-22 National Safety Council, 43rd National Safety Congress and Exposition, Chicago.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Garrett Hotel, El Dorado, Ark.

24-27 National Association of Railroad and Utilities Commissioners, natural gas panel discussion, Asheville, N. C.

27-29 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

28 Natural Gasoline Association of America, southern regional meeting, Captain Shreve Hotel, Shreveport.

31-Nov. 1 Independent Petroleum Association of America, annual meeting, Jefferson Hotel, St. Louis.

31-Nov. 2 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.

NOVEMBER

2-4 Society of Automotive Engineers, diesel engine meeting, Chase Hotel, St. Louis.

2-4 American Association of Petroleum Geologists, Mid-Continent regional meeting, Skirvin Tower, Oklahoma City.

9-10 Society of Automotive Engineers, fuels and lubricants meeting, Bellevue-Stratford Hotel, Philadelphia.

10-11 American Association of Petroleum Geologists, Pacific Section annual convention, Biltmore Hotel, Los Angeles.

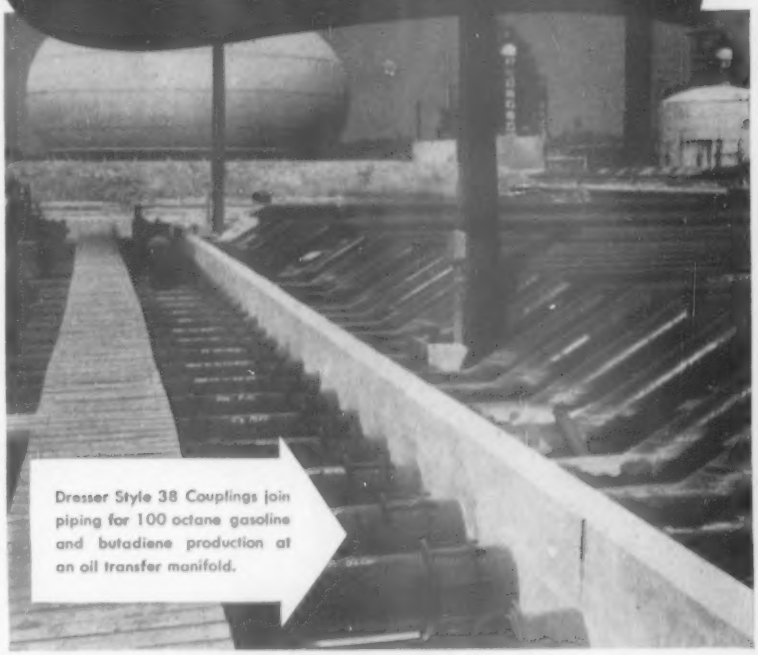
13-18 American Society of Mechanical Engineers, 75th anniversary meeting, Hilton and Blackstone Hotels, Chicago.

14-17 American Petroleum Institute, 35th annual meeting, Mark Hopkins, Fairmont, St. Francis and Palace Hotels, San Francisco.

27-30 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Detroit.

around a refinery...

the DRESSER way is easier...surer!



Dresser Style 38 Couplings join piping for 100 octane gasoline and butadiene production at an oil transfer manifold.

You'll find many piping applications in and around oil terminals and refineries where Dresser Couplings will simplify and speed up joining work. They're particularly advantageous for tank and equipment installations.

Dresser Couplings provide attractive features for refinery applications . . . they're easy and fast to install, bottle-tight and safe. The specially compounded rubber gasket permits up to 4° deflection at joints—yet with Dresser Couplings, these joints stay permanently tight.

AVAILABLE AT LEADING OILFIELD SUPPLY STORES

Style 38 Coupling | Style 40 Long Sleeve | Hydrepair*Asbestos Cement Pipe Clamp | Style 63 Expansion Joint | Style 39 Insulating Coupling

*HYDREPAIR is a trade-mark of Dresser Manufacturing Division

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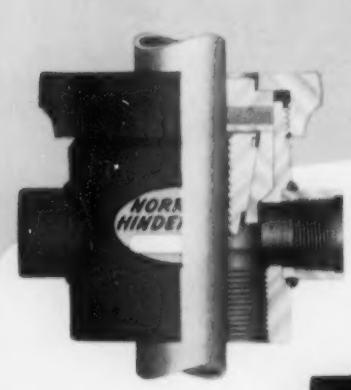

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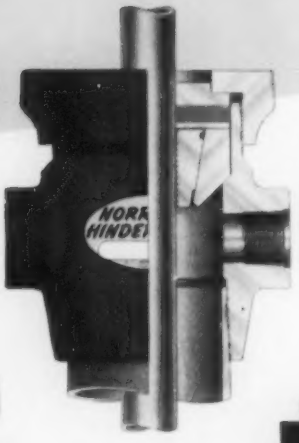
TUBING HEAD
2000# Test Pressure
1000# C.W.P.



HW 2-in-1
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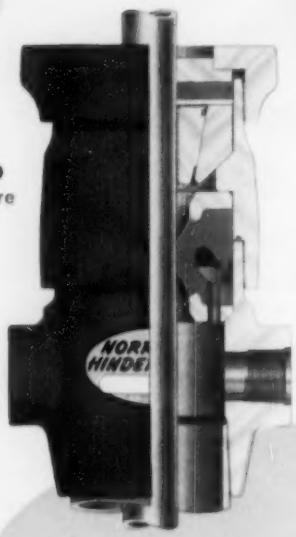
2000# C.W.P.

HW 4-in-1
TUBING HEAD
4000# Test Pressure
2000# C.W.P.



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The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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JOURNALLY SPEAKING...

You and U

WE have just come back from Colorado, and brother is the uranium fever running high up there!

Those who aren't clambering over the canyons with Geiger counters are in brokers' offices watching the activity of penny uranium stocks. Long-established mining companies, one-burro prospectors, week-ending shoe clerks, and even quite a few oil companies are in the uranium race.

The general assumption seems to be that oil, gas, and coal are passe, and that any day now all our power will come from splitting uranium atoms. It almost made us wonder if we weren't in the wrong racket.

But then we went to the meeting of the Interstate Oil Compact Commission and heard several papers by experts on energy for the future, and had our faith restored. We are now convinced that the petroleum industry will be around for quite a while yet.

As a matter of fact, these long-range predictions almost scared us in the other direction. These experts said that it will be 10 years or so before atomic energy is used very widely, and by that time the world's demand for fuel and energy of all kinds will be so huge and growing so fast that oil and gas won't be able to keep up.

For as far back as we can remember we've heard scare talk that "we're running out of oil." This was based on the assumption that practically all of the world's oil had been discovered and most of it already produced. Such silly notions, of course, were promptly disproved every time.

Today's crop of crystal gazers advance the theory that we will be producing oil for centuries and that our rate of production will keep on going up for a long time. But sometime in the future, maybe 10 years, maybe longer, oil production will reach a plateau and won't increase any more.

But in the meantime mankind's requirements for fuel and energy will be increasing so fast that oil won't be able to satisfy all the markets it now commands. So oil will have the pick of its markets and will take those where it can get the best prices, and will be perfectly content to let atomic energy, coal, or anything else have the leavings.

The predictions of these latter-day prophets make more sense than the running-out-of-oil malarkey—and they also hold more promise for the future of our favorite industry. The only catch is that they don't tell how the world's oil producers are going to live with their tremendous surpluses during the next few years until this predicted huge demand overtakes them. (Oracles usually omit a few little details like that.)

But the uranium hunters out in the Rockies don't think they are going to have to wait any 10 years for a market or that they will just get the leavings that the oil industry turns over to them as unprofitable. They have visions of U-powered electric-generating plants, ships, locomotives, airplanes, and automobiles day after tomorrow.

Right now the uranium producers have just one customer—Uncle Sam—and what he does with all the stuff is a mystery to everybody, except perhaps the Russians. We do know that the Navy has a U-powered submarine and that plans are afoot for building other stationary and marine reactors. But what we hear about costs and operating problems makes us think that oil men won't need to lose any sleep worrying about U competition for a good many years.

And as for a U-powered automobile, did you ever stop to think what would happen if one of them ran smack into something and scattered its innards along the roadside? The radioactive fallout would make the whole county highly unpopular for months. And besides, a car that would run for years and years without refueling wouldn't be subject to model changes, and who would want to buy a new car that was just like what his neighbor bought last year?

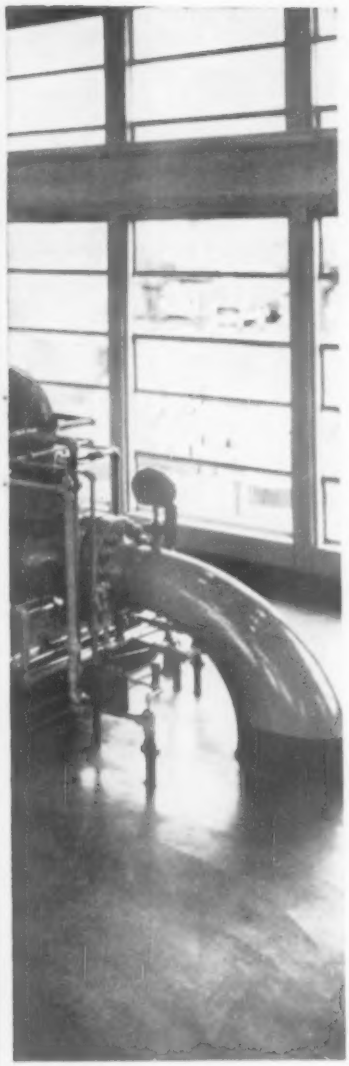
Our conclusion is that uranium hunting may be exciting, and that U power may find an economic place sometime in the future, but the oil industry is here to stay.

—Henry D. Ralph

ENGINEERING
REPORTS:

NO FIREWALL IS NEEDED FOR THESE 1250-HP EXPLOSION-PROOF MOTORS

FLEXIBILITY of General Electric equipment is illustrated by these two photos. Easily installed G-E Limitamp (left) is pre-packaged at factory, requires minimum of maintenance. G-E control center substation (right) has been fitted at right angles to Limitamp without sacrificing safety or convenience. Equipment's design features permit maximum space utilization and may easily be expanded.



Wolverine's new station uses G-E electrical system for 4-million-gpd throughput

G-E explosion-proof motors at Kennedy station in Hammond, Indiana, include largest installed to date

The Wolverine Pipeline System, supplying Niles, Jackson and Detroit, Michigan, and Toledo, Ohio, was built for dependable year-round transportation of petroleum products. To help maintain an ultimate throughput of 4 million gallons per day, Wolverine selected General Electric equipment for their "show-case" Kennedy Station in Hammond, Indiana.

Working closely together, Wolverine and G-E engineers developed a flexible electrical system that economically co-ordinates the two largest G-E expolsion-proof motors ever built up to the date of this installation—rated 1250 hp, 2300 volts, for Class I Group D location — with Limitamp* control, transformers, and a one-man station-control console. J. S. Cooper, Kennedy Station's chief operator, says, "Our G-E equipment—conveniently arranged and easily accessible for maintenance—has needed little or no attention since we started operating in January, 1954."

Here is another example to illustrate that, whatever *your* specific pipeline electrification problems, G.E. can help solve them—with a broad line of motors, control, and power-system equipment, engineered to your needs. For more information, contact your local G-E Apparatus Sales representative. General Electric Company, Schenectady 5, N. Y.

*Reg. Trademark of General Electric Co.

66-51

Engineered Electrical Systems for Oil Pipelines

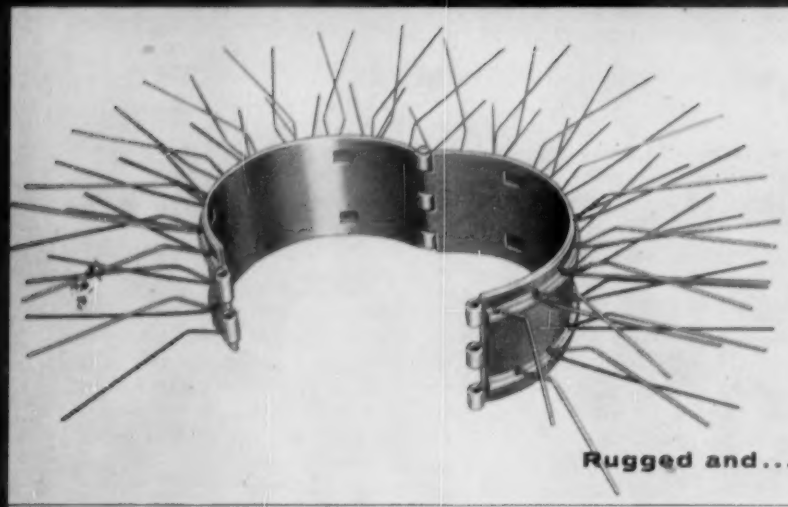
GENERAL ELECTRIC

ONE MAN CONTROL of entire Kennedy station is possible with this control console, custom built by G.E. to meet Wolverine's special requirements. Top surface of console contains diagram of Wolverine's pipeline and shippers' feeder lines and tanks. Lights and gages show which valves, tanks, meters and pumps are in operation at any given moment.

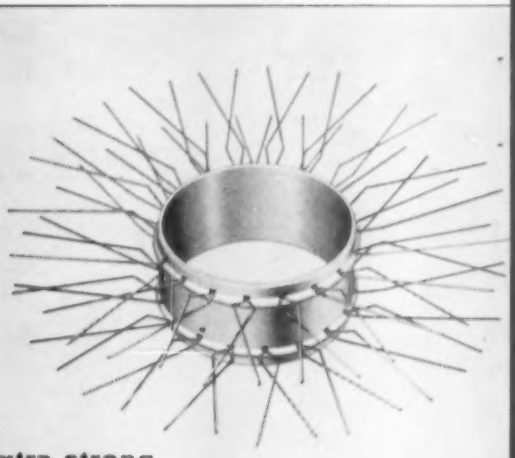
A completely new BAKER
WALL SCRATCHER

that removes mud cake effectively...
but only from the area to be cemented

MODEL "C"
HINGE-LOK
PRODUCT NO. 900-C



MODEL "C"
SOLID-RING
PRODUCT NO. 901-C



Rugged and... extra strong

Controlled Scratching—Baker Model "C" Wall Scratchers really remove mud cake, but only from the area to be cemented. The vital and expensive filter cake built up on areas outside of the cementing area is left practically undisturbed.

Greater Efficiency—Double row of wires, overlapped for added strength, provide more scratching points for more efficient removal of mud cake and complete coverage of the 360° surface of the well bore.

Greater Strength—Ruggedly built to deliver maximum performance. Double shell for added thickness and strength. Double ridges formed in shell for added rigidity. Hinge in Hinge-Lok Model, which is formed as part of inner shell, is backed up and given greater strength by outer shell.

Two-Ranges Available—Two wire lengths for each casing size. 4½" length (C-45) for normal clearance programs; 2½" length (C-25) for "slim hole" clearances.

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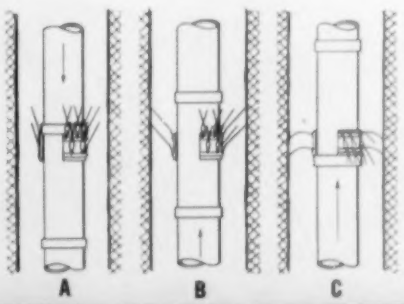


BAKER
WALL SCRATCHERS

Conservation is still a mystery in many places

AN unreasoning fear of market-demand proration was largely responsible for the failure of a number of 1955 state legislatures to adopt genuine conservation measures not related to proration and basically much more important than proration.

As a result, much of the nation's petroleum resources will continue to be wasted because of misunderstandings or misrepresentations of what conservation really is.

Actually, proration to market demand is the ultimate step in a conservation program—a little extra touch—and by no means a primary objective. It deals only with aboveground waste and the economic health of the producing industry. Market-demand proration has other things to commend it, but the volume of physical waste it prevents is inconsequential compared with the waste that can take place underground.

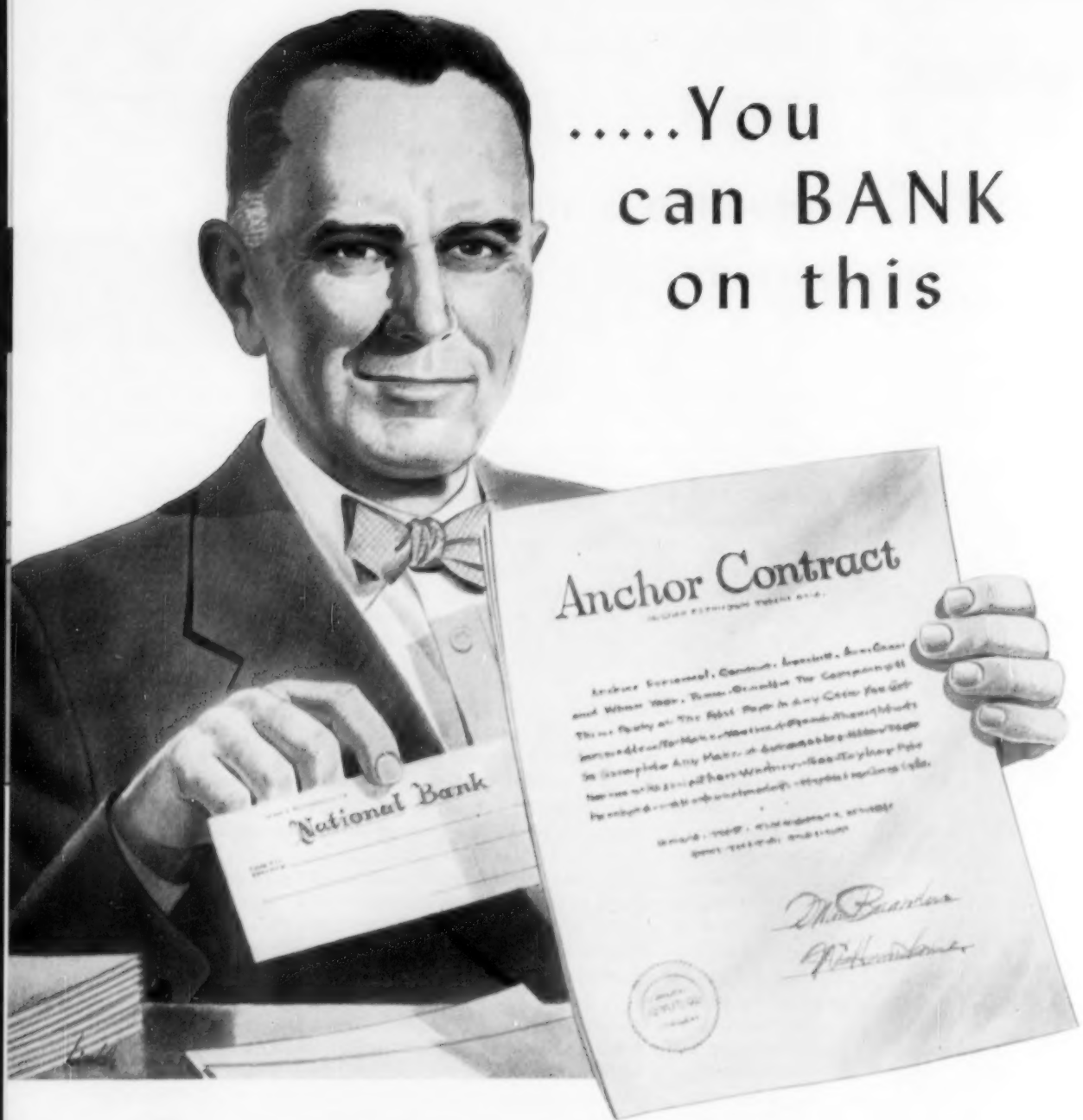
THE REAL CRUX OF CONSERVATION is manipulation of reservoir energy to get the greatest ultimate recovery of oil. This must be done in ways that protect correlative rights. Well spacing, M.E.R. proration, gas-oil ratios, unit operation, fluid injection, ratable take, and all the other features of regulatory practice except market-demand proration are devices to get more oil out of the ground under conditions of equity to the producers.

Yet this spring Montana, Wyoming, and Nebraska failed to enact sound conservation legislation largely because the idea got around that any sort of restriction on producing operations would lead to market-demand proration and that market-demand proration means that other states would tell these states how much oil they could produce. The notion is absurd, but persistent.

Colorado and Utah enacted new laws embodying some of the essential elements of conservation, but here too an unjustified fear of proration resulted in some language of doubtful workability. And, it is generally conceded, the new Colorado law probably does not correct the defect of the old law which made it impossible to reduce the notorious waste of reservoir energy in Rangely field.

The California Legislature was so thoroughly confused as to what is and is not true conservation that it passed a law, absurd from a legal standpoint and meaningless in effect, saying that conservation is a good thing but nobody has to practice it unless he wants to.

TO GET GENUINE CONSERVATION practices in areas where they are badly needed obviously requires some reeducation. Until the basic fundamentals are achieved there should be no talk of market demand nor of any kind of proration except the limitations of M.E.R. and reservoir control.



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THIS WEEK . . . . . IN THE NEWS

Tankers

• The United Kingdom will soon replace the United States as owner of the world's largest tanker fleet. In 1945 America controlled more tanker capacity than the rest of the world combined. It has now dropped below its pre-World War II position, Sun Oil Co.'s world survey reports. And the outlook is for the U. S. toboggan to continue downward while Britain keeps adding to its oil-transport fleet.

Pipelines

• Texas Eastern will start a campaign soon to sign up shippers now that it has FPC approval of its plans to convert the Little Big Inch line from natural gas to products. The gas capacity lost by converting the line will be made up with an extension now being added to Texas Eastern's 30-in. line from Mississippi to West Virginia. The company will be one of the nation's biggest products carriers when the conversion is completed.

• Don't count out the all-Canadian Trans-Canada pipeline. Winnipeg & Central Gas Co. has come up with a plan that would insure ultimate construction of the all-Canadian line. It would involve a swap of 500 million cubic feet of gas daily between Trans-Canada and Tennessee Gas Transmission.

• Pipeline construction in the Rocky Mountains will pick up now that Pacific Northwest has awarded contracts for 509 miles of line. This brings to 1,164 the number of miles of the 1,466-mile carrier contracted.

Government

• Quick application of oil-import limitations may result from a study being made by Mobilization Director Arthur S. Flemming. Some domestic producers have asked Flemming to order imports cut back to their 1954 ratio to production in the United States. He can take this step under the national-security clause of the new Reciprocal Trade Act.

• Two bills exempting natural-gas producers from federal price controls have finally reached the floors of both houses of Congress. Separate House and Senate committees approved the bills. House leaders are secretly counting their votes on the issue before deciding to press for early action.

Drilling

• Oil-field drillers will have new depth records to shoot at in Louisiana and Oklahoma. Wells still drilling in both states have shattered old marks. A crew of Richardson & Bass, Dallas, is drilling below 19,545 ft. in coastal marshes of Plaquemines Parish, Louisiana. That's already 885 ft. below the old record. Max Pray, Chicago independent, gets oil and gas at 13,873 ft. in a test 22 miles southeast of Chickasha in Grady County, Oklahoma. The old producing-depth record was 13,804 ft.

Offshore

• A hectic lease sale is shaping up for operators hoping to acquire new acreage off Louisiana. At first it was simple. The federal Government offered a large amount of acreage for lease. Louisiana then decided to offer state leases on 29 of the tracts lying within its claimed boundary of 10½ miles beyond its "coast line." Now the Government says it may sue any operator who tries to drill on any state-granted lease beyond the 3-mile limit. What oil companies do may remain a question until bids are opened July 12.

Refining

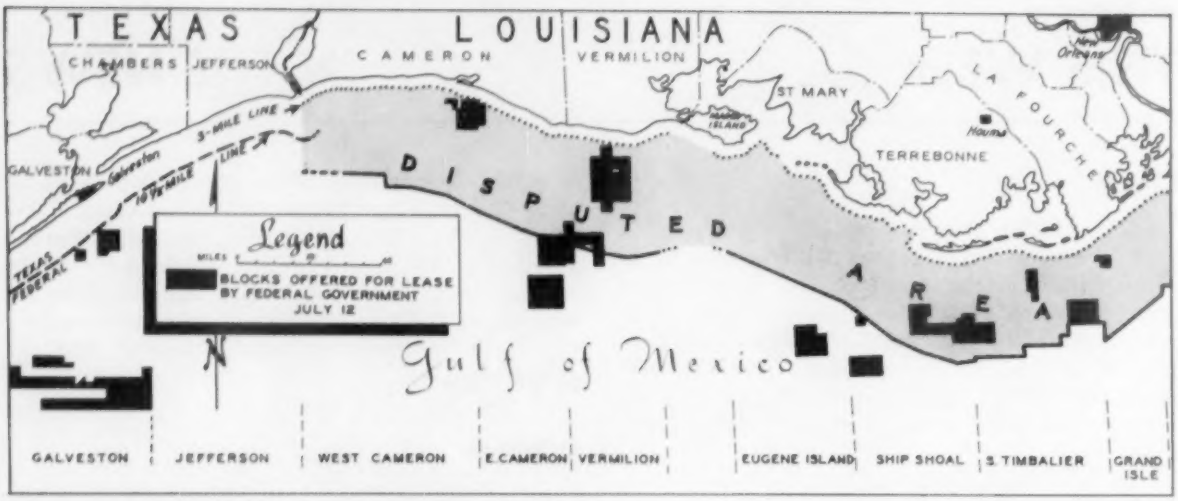
• Esso Research puts to work the world's most radioactive piece of material. Foot-long cobalt pipe will enable Esso scientists to study effects of gamma-ray radiation on chemical reactions. The hope: possible new products from oil, or cheaper or better ways of making conventional oil products in a refinery.

• Great Northern's 25,000-bbl. refinery near St. Paul will go on stream in August. Pipelines scheduled to move crude to the new plant have been finished, and wokmen are putting finishing touches on the plant.

International

• World oil output continues to break records. April production outside the Communist countries increased to 13,694,000 bbl. daily, 32,200 bbl. daily over March. The Middle East—in soaring to a new record itself—accounted for the entire free-world increase and offset a big decline by Canada as well. Output the first 4 months rose 11.2 per cent above the same 1954 period.

• A group of Texas oil operators and eastern financiers will take over Venezuela Syndicate, Inc., a royalty company with large holdings in Venezuela. Purchasers are the same combine which recently acquired control of Toklan Oil Corp., Tulsa.



Record snafu in prospect as . . .

. . . Tidelands Lease Fight Nears Climax

- **Twin offshore leasing slated for 29 disputed tracts; but winners in Louisiana sale may face court action**

- **Federal auction should show how eager operators are to tackle exploration in waters 100 ft. and deeper**

Joe Reilly

NEW ORLEANS. — Oil operators wanting leases in disputed waters off the Louisiana coast have been put in the position of a man trying to ride two horses at once.

Both Louisiana and the federal Government claim ownership of tidelands between the 3-mile line and the 3-league boundary. Both have scheduled sales of leases in the disputed area here July 12. And in the latest move, confusion was compounded when the Government warned that any operator who starts drilling under a state lease may be sued for trespassing.

To be on the safe side, operators must submit two sets of bids—and two bonus checks—at the July 12 sales. If a bidder winds up holding both state and federal leases on the same tract, he will be safe. But trouble will come if two operators get conflicting leases to the same tract.

Neither buyer nor seller actually will know which lease is valid until the United States Supreme Court decides the boundary dispute later this year.

Twenty-nine tracts in dispute . . . Principals in the rival lease sales are the State Mineral Board at Baton Rouge and the Interior Department's Bureau of Land Management in New Orleans.

The whole threat of extra red tape and whopping expense to oil men popped up when Louisiana challenged the Government's right to lease 29 offshore tracts. The Interior Department refused to withdraw the disputed leases from its scheduled July 12 auction. The state board then decided to hold an auction of its own for the disputed areas.

Acting Secretary Clarence A. Davis of the Interior Department delivered the latest blast last week. He warned the minerals board the Government would take legal action to protect its claim to the tidelands resources.

Davis told the state board in a letter that the Continental Shelf beyond the 3-mile limit is subject to leasing only by the federal Government.

"This department will recommend that appropriate action be taken if it appears that operations are being conducted upon any portion of the outer Continental Shelf under the purported authority of any lease issued as a result of your advertised sale," Davis warned.

Department officials would not say specifically what the "appropriate action" would be. But it has been suggested the department would ask the attorney general to appeal to the Supreme Court to halt state operations in the "twilight zone."

The Justice Department asked the Supreme Court May 19 to determine that Louisiana was entitled to only a 3-mile belt beyond the low-water mark in the Gulf of Mexico. Atty. Gen. Herbert Brownell, Jr., conceded that the state might own the islands lying within 3 leagues of the coast. But he told the court that ownership did not include the waters in that area which the state also claimed.

Because of the short time remaining before the Supreme Court ended its term it was not possible to pass on the issue. The state will make its reply and the case will be ready for consideration when the court opens its 1955-56 term next October.

Identical tracts offered for leasing by the warring governmental agencies comprise about 70,000 acres. This area actually is only part of the twilight zone where federal and state claims overlap. The state, under a 1954 law, set its seaward boundary 3 leagues from its "coastline." This line at places wanders 25 miles into the Gulf of Mexico.

Compromise hinted . . . Louisiana's latest counterattack, reportedly directed personally by Gov. Robert F. Kennon, indicates the state may be seeking a compromise placing its boundary at 3 leagues (about 10.5 miles) from the mainland. The tracts which the state previously asked to be withdrawn from the July 12 lease sale covered approximately 244,000 acres, several times the area on which duplicate leases are being offered. Some of the area involved in the earlier protest lies nearly 35 miles from the mainland *(The Oil and Gas Journal, May 30, page 54).*

CITIES SERVICE CO.'S drilling tender, the J. C. Craig, may see some service in water more than 100 ft. deep as result of the federal leasing next week. Several of the tracts are in 100-ft. plus water. The tender is shown here moored to a rig on location 12 miles in the gulf.

Louisiana's new challenge has restricted the already troubled waters in which offshore operators are looking for new oil reserves. But only a small portion of the big area offered for lease by the federal Government July 12 will be subject to the dual auction.

In all, the federal Government is asking bids on 210 tracts in the Gulf of Mexico. They cover about 674,000 acres and include 39 tracts off Texas in addition to 171 tracts off Louisiana. The leases offered by both the state and federal Government are mostly off Cameron and Vermilion parishes.

State deal best . . . For financial reasons, successful bidders may be better off if the Supreme Court rules in favor of the state in the dispute. The Interior Department demands one-sixth royalty on the submerged lands. The state has set the minimum at one-eighth.

What the successful bidders in the federal sale will get is a hunting license which permits them to spend millions of dollars looking for oil. The license may be suspended in the disputed areas unless it is ratified by the state or until the Supreme Court sets the boundary.

Most of the submerged tracts to be put on the auction block in the federal sale are in "no-man's land."

In addition to the big disputed area, nearly a third of the acreage is in tracts lying under water 100 ft. or more in depth. This is far deeper than any gulf waters previously drilled.

High bids expected . . . Despite these obstacles, the industry is likely to pay a near-record price for the privilege of probing the ocean bottom in search of oil. There are several factors indicating bids may be high:

. . . New records have been set nearly every time either a state or the federal Government has offered offshore leases.

. . . Operators nominated tracts totaling 595,000 acres for bidding in this summer's federal sale. This acreage is considerably greater than the 461,870 acres leased by the Interior Department in its two offshore lease sales last year.

. . . Early drilling success on the Continental Shelf has attracted a growing number of companies to the gulf tidelands. Developments so far lend weight to earlier predictions that submerged lands offer this country's greatest potential for future oil discoveries.

. . . Deep water is no longer considered the obstacle that it was even a year ago.

The CATC group, composed of Continental Oil Co., Atlantic Refining Co., Tide Water Associated Oil Co., and Cities Service Oil Co., has announced plans to drill in more than 100 ft. of water in the Grand Isle area off Louisiana. A mobile drilling platform already at work in the Gulf of Mexico for Shell Oil Co. and others is designed for drilling in water as deep as 100 ft. Humble Oil & Refining Co. has contracted for another platform capable of drilling in similar depths.

Offshore operators are willing to increase their ante in the big tidelands gamble, and they are looking farther and farther from dry land in search of new prospects. T. S. Petersen, president of Standard Oil Co. of California, revealed recently his company is planning a floating rig capable of drilling in water 150 ft. or more in depth.

Deep-water tracts . . . Next week's federal sale will give the industry a chance to show just how eager it is to work in deep waters far from shore.

Of the 674,000 acres off Louisiana and Texas on which bids have been invited, 23,040 acres are in blocks lying under as much as 145 ft. of water. This acreage is in Blocks A-99, A-100, A-101, and A-102 off the coast from Galveston County, Texas. Nine other tracts totaling more than 50,000 acres are under approximately 140 ft. of water.

Most of the tracts in deep water are off the Texas coast, but at least 14 such blocks off the Louisiana coast lie under 100 ft. or more of water.

Barge Uprighted

American Tidelands giant will be towed to shipyard

NEW ORLEANS.—The $2-million drilling barge which capsized in 37 ft. of water in the Gulf of Mexico last month was hoisted back to an upright position last week.

The unit will be towed to a New Orleans shipyard for repairs before resuming operations off the coast of Grand Isle.

Owned by American Tidelands, Inc., the barge had just completed its first drilling job for Humble Oil & Refining Co. when it overturned June 17. The accident occurred as crewmen were preparing to refloat the vessel to move it to a second drilling location.

Extent of damage to the barge had not been determined last week. A spokesman for J. Ray McDermott & Co., Inc., which salvaged the unit, said plans call for moving it to shallow water before attempting to refloat it. Temporary repairs to damaged sections of the hull may be necessary before the barge can be towed back to shore.

The barge, which is 200 ft. long and 75 ft. wide, was about two-thirds submerged in water when it overturned (*The Oil and Gas Journal, June 27, page 69*). Two large derrick barges and several smaller barges were used in setting it right-side up.

New Product System?

Texas Eastern needs only to beat an injunction suit by barge operators to reconvert its famed Little Big Inch

Robert J. Enright

SHREVEPORT. — Texas Eastern Transmission Corp. is well on its way toward becoming one of the world's largest product-pipeline operators.

The company needs only a favorable decision by a Circuit Court judge here to convert its Little Big Inch gas line to products service. It already has received a Federal Power Commission permit for the project.

A group of barge operators who move products on the Mississippi and Ohio rivers are seeking an injunction barring conversion of the famous line, which originally was built to move products from Gulf Coast refineries to the hard-pressed Eastern Seaboard.

The suit is based on charges that Texas Eastern is trying to exercise a monopoly in shipment of oil products to the East.

A decision in the suit is expected this month, and it will surprise a lot of people if an injunction is granted. Even if the decision favors Texas Eastern, however, the court struggle may go on for some time.

The barge operators are determined to fight conversion of the line with every weapon and might carry the fight to the U. S. Supreme Court.

They lost their first big test June 24 in Washington.

Biggest obstacle cleared . . . On that date Texas Eastern, in a unanimous decision of the Federal Power Commission, obtained approval of its plans to abandon natural-gas service through 1,168 miles of the Little Big Inch and to build new facilities to make up the lost gas capacity.

The FPC decision was crucial for Texas Eastern and regarded as its biggest obstacle. The ruling apparently was based on two things. It was proved to the commission's satisfaction that the program would not increase the cost of gas to eastern consumers and that Texas Eastern was well able to lay its hands on the needed $86,600,000.

FPC thus cleared the way for the company to convert to products service the 20-in. section of the Little Big Inch extending from its Gulf Coast terminus in the Baytown-Beaumont, Tex., refining area to Moundsville, W. Va. The line extends north and east to Linden, N. J., but this portion will remain in natural-gas service.

Texas Eastern is replacing the abandoned gas capacity by laying 382 miles of line from the Baytown-Beaumont area to Kosciusko, Miss. There it will connect with a 30-in. line laid by the company in 1952 from Kosciusko to Moundsville.

From the Gulf Coast the line will extend northeast to a point north of Lafayette, La., due east to cross the Mississippi north of Baton Rouge, then northeast again to Kosciusko passing near Jackson, Miss.

Increased compressor power . . . The company plans also to build 10 compressor stations totaling 86,900 hp. Three of these will be on the 24-in. extension, the remainder on present facilities. Compressor capacity at existing stations would be hiked another 36,020 hp.

Another 100 miles of smaller lines would be built in the Baytown-Beaumont area.

The $86,600,000 which Texas Eastern estimates will be required to finish the huge program includes $14,800,000 for converting the Little Big Inch and $71,800,000 to build the new gas facilities.

The company already has laid the basis for senior financing through an agreement with eight insurance companies which will buy $40,000,000 worth of first-mortgage pipeline bonds.

George T. Naff, Texas Eastern president, said the reconversion project could begin immediately. The company expects, he said, to start piping products on a common-carrier basis through the Little Big Inch by the fall of 1956 or earlier. Products would include L.P.G.

Naff said the products operation

would be conducted as a division of the parent company.

Drive for contracts . . . Conversion of the Little Big Inch to products service as presently planned will permit Texas Eastern to deliver up to 265,000 bbl. of products a day to the Mississippi and Ohio river valleys.

It will open up, according to Naff, "many important marketing areas not presently accessible by products pipeline."

River terminals would be located at Arkansas City, Ark., and Cape Girardeau, Mo., on the Mississippi River and near Louisville, Ky., and Moundsville, W. Va., on the Ohio River. The terminal at Arkansas City was obtained by Texas Eastern with its purchase of a 276-mile products system from Triangle Pipeline Co. early last year. This system runs from Carthage, Tex., to Arkansas City. It was Texas Eastern's first venture into products transmission *(The Oil and Gas Journal, February 22, 1954, page 113).*

Texas Eastern so far has no conditional contracts with major refiners for products to go through the converted line and has made no marketing arrangements. The company is expected to start negotiating supply and market contracts immediately.

No rate schedule for products transportation has been announced yet either, though the company has said that its rates would be "competitive with and lower than" current charges for other forms of transportation.

Plans may change . . . Texas Eastern plans appear to be pretty well defined for the conversion, but the whole picture could change drastically if the Government accepts a company offer to provide standby products-pipeline capacity in event of an emergency *(The Oil and Gas Journal, June 13, page 140).*

The offer, made to Mobilization Director Arthur S. Flemming, was for 800,000 bbl. daily of emergency pipeline capacity. The company, however, wants accelerated amortization of the cost and reportedly some other government aid.

Along with converting the Little Big Inch, Texas Eastern proposed putting standby pumping equipment along this line to hike capacity to 375,000 bbl. daily, standby pumps on the Big Inch to raise its capacity when changed over from natural gas to 425,000 bbl. daily, and standby compressors on its new 30-in. through Kosciusko to handle the Big Inch gas load.

The Government so far has had nothing to say publicly about the proposal. Texas Eastern also is keeping quiet.

Line completes cycle . . . When the Little Big Inch starts taking products, and this appears in the cards in spite of the barge operators, it will be doing the job for which it was built.

The line, together with the Big Inch which it parallels, was built on an emergency basis during the second World War in the early 1940s when enemy subs were taking a heavy toll of U. S. tankers. After the war, the Government sold the lines at auction. Texas Eastern bought both early in 1947 for a total of $143,127,000 and immediately converted them to natural-gas service.

The FPC made note of this in its June 24 decision approving reconversion. It recalled that the purchase agreement between Texas Eastern and the Government gave the company the right to use the lines for either gas or products, and that the Government could reclaim them in event of another emergency. "It is in the public interest," the agency said, "to remove from customers of Texas Eastern the threat that the Government may exercise the recapture provisions."

Depth Record Set

Indicated producer gives up oil, gas at 13,873 ft.

TULSA.—Max Pray, Chicago independent, appears to have set a new depth record for a producing oil well in Oklahoma with his 13,873-ft. strike in the deep Bradley district about 22 miles southeast of Chickasha in Grady County.

The indicated record-breaker is the 1 Billy, located only 3 miles west of Phillips Petroleum Co.'s 1 Steve, the present record-holder completed last year at 13,804 ft.

The new deep test is a 1-mile extension to Southwest Bradley field. It entered the Bromide said at 13,800 ft. On drill-stem test at 13,810-73 ft., gas volume in 16 minutes was estimated at more than 10,000 M.c.f. per day. The test recovered 1,759 ft. of 44°-gravity oil.

Phillips' record well found production in the Oil Creek sand.

The area is buzzing with activity as operators go about proving up the large indicated reserves of deep Ordovician oil. The trend is moving northwest. It is located off the northwest side of the Golden Trend.

The Ordovician trend coincides with the prolific, fast-growing Springer-Pennsylvanian trend in the Grady-McClain-Garvin county area of south-central Oklahoma.

Industry Briefs

SHREVEPORT, La. — David Crow Drilling Co. has sold an interest in 52 producing wells in Arkansas, Louisiana, and Texas to Trans-Tex Drilling Co., which recently moved its offices here from Longview, Tex. W. O. White, Trans-Tex president, said the transaction involved more than $1,000,000. Trans-Tex is a wholly owned subsidiary of Husky Oil Co., Cody, Wyo.

OKLAHOMA CITY. — Oklahoma producers will have the same oil allowable in July that they had in June. The Oklahoma Corporation Commission voted last week to leave the allowable for July unchanged at 550,000 bbl. daily. Purchasers asked for 500,637 bbl. of oil daily for July, the first time they had requested more than 500,000 bbl. for 2 years. The August and September allowable will be set by the commission this month.

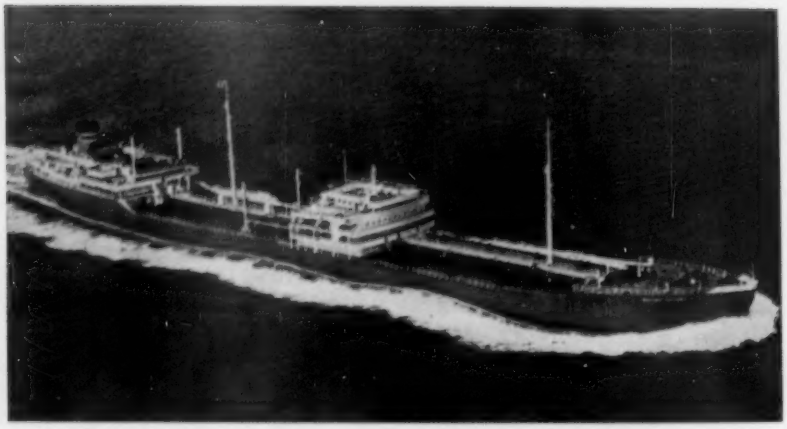
AUSTIN, Tex.—A graduate course in petroleum reservoir engineering will be held August 26-September 15 at the University of Texas. Registration deadline is July 15. The course will explain means of predicting performance of several oil reservoir operations. Instructors will include A. F. Van Everdingen of Houston, chief reservoir engineer for Shell Oil Co., and Drs. H. H. Power, E. W. Hough, and W. T. Guy of the university faculty.

TOPEKA.—The oil allowable in Kansas has been raised from 300,000 bbl. daily in June to 315,000 bbl. in July. The Kansas State Corporation Commission continued a 25-bbl. daily limit on prorated wells but lifted a 10 per cent restriction on wells in nonprorated fields.

DENVER.—The foundation has been poured and structural steel work begun on Ohio Oil Co.'s $1-million research laboratory near Littleton, 11 miles south of here. The main building, which will contain 45,000 sq. ft. of floor space, is scheduled for completion in June 1956. A staff of approximately 100 will occupy the lab.

LINCOLN, Neb.—Gov. Victor An-derson has signed a bill passed by the Nebraska Legislature placing a 2 per cent tax on oil and gas produced in the state. The tax is expected to yield about $400,000 a year.

BATON ROUGE.—Louisiana's oil-production allowable for July has been set at 683,626 bbl. daily, an increase of 19,927 bbl. per day over the June figure.



THE "BRITISH VICTORY," a 32,000-ton tanker, undergoes speed trials off the Isle of Arran, Scotland, before leaving for her maiden voyage to the Persian Gulf. The ship is the sixth in the 225,000-bbl. class to join the fleet of British Petroleum Co., Ltd.

U. S. Tanker Lead Cut

United Kingdom closes gap with ships on order or being built as America's world position continues to decline

PHILADELPHIA. — The United States has virtually lost its world tanker leadership to the United Kingdom.

At the beginning of 1955 Uncle Sam held the lead with 23.3 per cent of the world's carrying capacity compared to the United Kingdom's 17.7 per cent. But Britain will have closed the gap by the time tankers under construction and on order last December 31 begin calling at the world's oil ports.

The skid has already carried the United States below its pre-World War II level. And the outlook is for continuation of the 9-year decline from its war-created position of controlling more tanker capacity than the rest of the world combined.

That picture of America's waning importance as an ocean oil carrier in contrast to tremendous upsurges by Britain, Norway, Liberia and the rest of the world generally was outlined in Sun Oil Co.'s annual analysis of world tankship fleets.

While world capacity grew 12 per cent during 1954, the United States' inventory fell to 525 tankers, 25 fewer than December 31, 1953. There were only eight tankships under construction or on order for U. S. registry last December. Great Britain had 95.

How nations rank . . . On completion of both programs, the United States will possess only 19 per cent of the world's tanker capacity and Great Britain 18.8 per cent. The time is at hand when Britain will take command. And there is no evidence to indicate a reversal which would return the world's largest producer of oil to its former oil transport supremacy.

Behind the two big leaders come Norway, with 14.8 per cent of the world's capacity; Liberia 9.1 per cent, and Panama 8.7. These five flags accounted for almost three-fourths of world capacity. No other nation had as much as 5 per cent.

While world inventory rose substantially during the past year, the post-war tanker construction boom was checked. The tonnage building on order December 31 represented a decline of almost 29 per cent from 1953.

These figures do not tell the whole story, however. Sun analysts point out the United States controlled an additional 305 vessels registered with friendly foreign governments. There were 121 registered in Panama, 58 in Liberia, and 53 in Britain. The others were widely distributed.

America had a net decline of four in the number of tankers controlled, but carrying capacity rose 5.9 per cent, and totaled 37.4 per cent of world capacity.

Supertanker boom . . . This points up a significant trend toward concentration on supertankers, the big, fast and ultra-efficient vessels of 24,000 deadweight tons or larger. They carry America's hope for competing with the cheaper labor and lower operating costs of foreign flag ships.

U. S. tankers under construction or ordered averaged 27,500 tons, or some 5,000 tons greater than the average of ships being added to fleets for the rest of the world.

The world tonnage under construction was equivalent to 590.4 T-2's, the well-known vessels of 16,765 deadweight tons capable of cruising at 14.5 knots which provide a yardstick for comparison.

Sun's worldwide inventory of ocean-going tankships of 2,000 gross tons or larger showed 2,602 vessels totaling 39,137,300 deadweight tons or 25,700,000 gross tons. Deadweight tonnage of the leading nations on January 1 was:

United States 8,446,200, United Kingdom 7,374,600, Norway 5,981,500, Liberia 3,271,100, and Panama 3,306,800.

The only other nations with as much as a million tons capacity were Italy with 1,733,100, France 1,573,600, Sweden 1,351,000, and Japan 1,024,700.

U. S. loses ground . . . United States capacity dropped 0.7 per cent during the past year. Only Panama among the other major maritime nations registered a decline, and that was 1.3 per cent. Liberia rocketed upward 62.1 per cent, Norway 13.3, and the United Kingdom 10.4.

Significantly, nations outside the Big Five increased 18.3 per cent, showing the growing share of the tanker business being won by rest of the world.

Since just prior to World War II, capacity has grown 189.3 per cent for the world in general. While world inventory increased 77.5 per cent since the war, the United States fleet dropped almost one-third. America's diminishing importance in this field is further illustrated by the fact no other major nation has lost ground.

Panama meanwhile quadrupled its fleet. Britain's doubled. and Norway's trebled. Liberia came from nothing to a fleet of 204.1 T-2's, and is still expanding.

Foreign registry up . . . United States companies are taking advantage of cheaper operations under foreign flags more than ever before. And the trend has been evident throughout the post-war period.

The share of U. S.-controlled tonnage under foreign registry on September 1, 1949, was 27.1 per cent. It was 33.2 per cent on October 1, 1952. The figure rose to 33.6 per cent by the end of 1953, and now has reached almost 38 per cent.

The United States cutback in tanker construction has given the country an older fleet than any other member of the Big Five. The average age of U. S. tankers last December was 10 years and 2 months. The world average was 8 years and 3 months.

1 Truck carrying world's most radioactive single piece of material crosses George Washington Bridge en route from Brookhaven National Laboratories.

2 Three-ton lead-and-steel container holding the radioactive cobalt pipe is unloaded by a towering crane at Esso's research center in Linden, N. J.

3 Radioactive pipe is wheeled into the radiation laboratory's "cave" room. The lab is the first such privately financed atomic radiation facility in the oil industry.

4 The material is put to work. Dr. J. F. Black operates mechanical hands to move the radioactive pipe into position. The pipe is in the aluminum cannister, seen here through a 3-ft.-thick lead-glass window.

Esso Puts Radioactive Pipe to Work

LINDEN, N. J.—Esso Research & Engineering Co. took a lot of care in moving a 1-ft. length of 2-in. pipe to a new laboratory building here. And rightly so. For it is the most radioactive item ever produced for peacetime use. The cobalt pipe had been "soaking" in an atomic reactor at Upton, Long Island for the past 2½ years. This prolonged neutron bombardment gave it a radioactive strength of about 3,500 curies. If all the refined radium in the world were collected into one piece it would have a strength of 2,400 curies. The pipe, now safely installed, will be used to study the effect of gamma-ray radiation on the chemical reactions of petroleum hydrocarbons. Scientists hope it will give them clues to the manufacture of new chemicals from oil or to simpler or better ways of processing crude oil into refined products *(The Oil and Gas Journal, November 29, 1954, page 42).*

Demand to Go Up

35 per cent hike seen by Conoco president by 1965

SANTA BARBARA, Calif.—A 35 per increase in domestic demand for oil products by 1965, despite the development of atomic energy, is forecast by L. F. McCollum, president of Continental Oil Co., Houston.

Speaking to the California Investment Bankers Association last week, McCollum predicted.

. . . **A steady annual advance** of 3 per cent in domestic demand until 1965.

. . . **Demand 10 years hence** will be 10,500,000 to 11,000,000 bbl. daily compared with 7,750,000 bbl. last year, an increase of 35 per cent.

. . . **The free-world market** outside the United States will continue to develop at about double the domestic rate, "which will result in a 1965 foreign demand almost equal to that of the United States."

. . . **The need to find** new petroleum reserves to meet the nation's fuel requirements will continue "despite advances in atomic energy and jet and turbo-prop engines."

. . . **A new era,** in our lifetime, with fuel for gas-turbine automobiles being dispensed through the present "house brand" gasoline pumps.

McCollum said the problems of shielding atomic-power plants to eliminate deadly radiation effects will delay "and may actually prevent the successful development of atomic engines in automobiles, airplanes, and locomotives for civilian use."

He noted that with the growing use of jet and turbo-prop engines, the pendulum in aircraft fuel appears to be swinging away from the "gasoline economy."

"At present, it would appear possible that a further shift toward the old 'coal oil' economy could occur with the introduction of gas-turbine engines in automobiles."

McCollum told the bankers there are still big oil fields to be found in the world. Their discovery and development, he said, will be limited "only by man's ingenuity, imagination, and willingness to look beyond present horizons." A favorable political and economic climate is essential to this development, he said.

Standard Companies Clash

CHEYENNE, Wyo.—A trade-name suit filed by Standard Oil Co. (Ind.) against Standard Oil of Ohio and its subsidiaries is under way in U. S. District Court here.

Standard of Indiana contends Standard of Ohio and its subsidiaries can not legally use the trade name Sohio in states where the Indiana firm has been operating for a number of years.

Attorneys for both sides estimate the presentation of testimony will require 2 months.

Octanes Up Again

Premium rises 2 numbers above 1954, regular 1.7

NEW YORK.—Octanes shot upward another 0.3 of a number in the latest survey by Ethyl Corp. and much of the refining industry contributed to the significant gain.

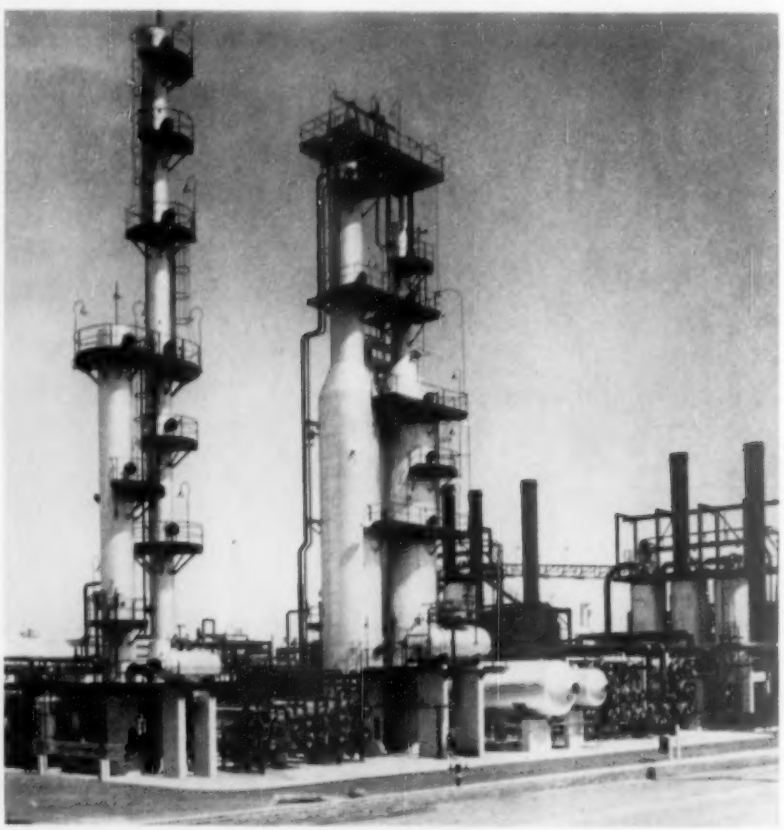
Both premium and regular grades of gasoline showed octane-number increases from May to June in 77 per cent of the market centers from which samples were taken. And the current increase rate is now almost double the postwar average of one number a year.

The weighted average for premium reached 95.6 research octane number, 2 above a year ago; regular tested 88.3, up 1.7.

Both grades showed gains over May in 41 of the 53 areas checked early last month. Tests on 850 samples purchased showed one of the most widespread increases on record. A jump of one-half octane number was logged by premium in 11 areas and by regular in 13. Average tetraethyl lead content was 2.58 ml. per gallon for premium and 2.22 for regular.

The highest premium areas were Birmingham, Memphis, and Corpus Christi with 96.8, and Atlanta and Buffalo, 96.7 Five cities, mostly on the East and Gulf coasts, showed arithmetical averages of 96.6.

In regular grade Boston led with 90.7. Next came New York and Philadelphia, 90.5; Pittsburgh, 90.4; Baltimore, 90.2; and Hartford and Richmond, 90.1.



Making High-Quality Gasoline for California Standard

This large Unifining-Platforming unit at Richmond, Calif., is the second with 22,200-bbl. daily capacity to go on stream for Standard Oil Co. of California. The other is at El Segundo, Calif. The two multimillion-dollar installations are turning out 1,500,000 gal. of new motor gasolines per day. Charge to the Unifiner consists of straightrun and thermal naphthas. The mild hydrogen treater will serve as a feed-preparation unit for the catalytic reformer. Two smaller catalytic reformers, also part of California Standard's $50,000,000 program to upgrade gasoline quality, are under construction at refineries operated by Standard subsidiaries at Vancouver, B. C., and El Paso, Tex.

Depth Mark Falls

Coastal test is now below 19,545 ft., still running

NEW ORLEANS.—Louisiana, where deep drilling is routine, has a new depth record.

It was set by a wildcat being drilled by Richardson & Bass, of Dallas, in the coastal marshes of Plaquemines Parish's Mississippi River Delta area, 35 miles southeast of here.

Drilling below 19,545 ft., it is 885 ft. below the depth of the state's previous deepest test, drilled by Magnolia Petroleum Co. in Allen Parish and abandoned in 1952 as dry at 18,660 ft.

Depth of the Richardson & Bass test, 1 LL & E-Humble-"L," is exceeded in only three other tests in the country. They are: Ohio Oil Co. 72-4 Kern County Land Co.-A, Paloma field, Kern County, California, abandoned at 21,482 ft. in 1954; Superior Oil Co. 1 Unit, wildcat in Sublette County, western Wyoming, abandoned at 20,521 ft. in 1949; and Vassen's 1 Fee, Stone County, Mississippi, which drilled to 20,450 ft. in 1953.

Associated with Richardson & Bass in Louisiana operation are John W. Mecom, of Houston, and Freeport Sulphur Co., New Orleans. Drilling was started February 27, this year. Last string of casing is 9⅝-in. pipe, cemented at 13,656 ft., leaving 5,889 ft. of open hole to present depth.

Location is 5 miles northeast of Lake Washington field.

New Type Plant Planned

NEW ORLEANS.—A "rotosorber" plant designed to process about 40,000,000 cu. ft. of natural gas a day will be built at the Bayou Sale field in St. Mary Parish.

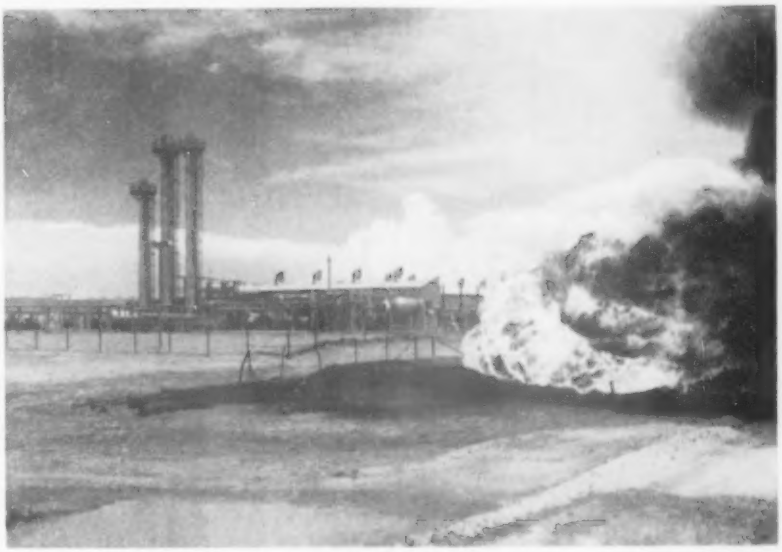
The unit will be built and operated by Jefferson Lake Sulphur Co. under an agreement with Atlantic Refining Co., which will supply the gas.

It will use an absorbent process which will simultaneously dehydrate and selectively recover liquids. The process was invented by Ernest B. Miller, vice president of Jefferson Lake.

Great Lakes Will Expand

KANSAS CITY.—Great Lakes Pipe Line Co. will increase the capacity of its products system between Des Moines and Iowa City by building a 106-mile, 12-in. line between the two points.

The new construction will parallel 6 and 8 in. lines. It will be completed by next fall's heating system. The three lines running east from Des Moines will serve Great Lakes terminals at Iowa City and Chicago and connecting terminals at Amboy, Ill., and Madison, Wis.



Continental Douses Flare at Colorado Plant

This flare no longer burns at Continental Oil Co.'s Plant 25 in Little Beaver field, Morgan County, Colorado. The natural gas formerly flared is now being picked up by Colorado Interstate Gas Co., which tied into the plant June 20. The plant is connected to practically all wells in Little Beaver, Badger, and Bobcat fields in the Denver-Julesburg basin. It has been in operation 5 months.

Pipeline Work Let

Four firms share latest Pacific Northwest jobs

HOUSTON.—Construction contracts totaling $7,065,000 have been awarded for work on 509 miles of mainline and lateral and 47 miles of gathering lines of the Pacific Northwest Pipeline Corp. project from Colorado to the Canadian border.

Contracts cover the four main-line sections running from near Burley, Idaho, to the Columbia River at the Oregon-Washington border. This portion of the 1,466-mile main-line system will consist of 412 miles of 22-in. steel pipe. Also awarded were 97 miles of 10¾ and 16-in. lateral lines running to Big Piney field and the Piceance Creek field as well as 47 miles of gathering system lines in these areas.

Awards covering the first eight main-line sections were made in mid-May. They covered portions of the line from Ignacio, Colo., to Burley, Idaho. Construction already is under way on them *(The Oil and Gas Journal, May 23, page 83)*.

Successful contractors on the latest bidding were:

. . . H. B. Zachry Co., San Antonio, Tex., on sections 9 and 10, 214 miles of 22-in. between Burley and Payette, Idaho.

. . . Fulghum Construction Co., Harrisburg, Pa., on sections 11 and 12, 198 miles of 22-in. between Payette and the Columbia River.

. . . A. J. Curtis Construction Co., Casper, Wyo., section 26 (Big Piney area) 54 miles of 16-in. lateral and 31 miles of gathering-system line of 2⅜ to 18-in. from a point on the main line near Kemmerer, Wyo., to Big Piney field.

. . . R. H. Fulton & Co., Lubbock, Tex., section 27 (Piceance Creek area), 43 miles of 10¾-in lateral line and 16 miles of gathering-system lines of 3½ to 10¾-in. from Rangely, Colo., to Piceance Creek field.

Buckeye Adding to System

NEW YORK.—Converting a crude-oil line to products service and building a new products line highlighted the summer construction program of Buckeye Pipe Line Co.

The crude line runs between Toledo and Cleveland. The firm will add a new pump station at Toledo and install additional pumping equipment and tankage at Wakeman Station, Ohio. Completion is set for October 1.

The products line will be approximately 60 miles of 8-in. between Lima, Ohio, and Fort Wayne, Ind. The line will be finished by the end of the year.

Buckeye will also lay a 14-mile, 10-in. crude line from its Wayne, Mich., station to Detroit.

Gas Bill Gets New Push

Measures head to House, Senate floor tests after approval by committees; Eisenhower gives friendly support to bills

WASHINGTON.—Exemption of natural-gas producers from federal regulation is as valid today as when the Natural Gas Act was adopted in 1938. That's the opinion of a 16-man majority of the House interstate commerce committee given last week.

But a 15-man minority charged the Harris bill to override the Supreme Court decision in the Phillips case is a "disguised 'backdoor' surrender of regulatory control to the producers." This group declared the proposal provides a windfall for pipeline companies and, through "built-in" features, inevitably will result in higher consumer rates.

Release of the majority and four minority reports from the committee was only one of several developments in gas legislation during the week:

. . . **The House** rules committee sat on the Harris-Wolverton resolutions calling for an all-out investigation of gas costs from the producer to the ultimate consumer, apparently waiting to see what the House will do with the Harris bill.

. . . **The Senate** interstate commerce committee voted to send its version of the Harris bill to the Senate floor. It made one change, designed to prevent producers from abandoning service if their escalation clauses are knocked out.

. . . **President Eisenhower** told a news conference he believes Congress is making progress on legislation to protect the consumer without discouraging development of new sources of natural gas. The President, who is opposed to the general idea of price controls, was asked whether he feels there should be any exception in the price of gas at the wellhead. That is an argumentative subject, he said, repeating that he thinks Congress is taking care of the matter.

Early action asked . . . House Committee Chairman J. Percy Priest of Tennessee said he will ask the rules committee to send the Harris bill to the House floor immediately. But House leaders indicated the bill would not be set for action until they had counted the votes in both parties. They would rather have the bill go over until next session than to have it defeated now.

There was no indication whether the bill would be held back in the Senate until after the House acted. The House, however, moves faster than the upper chamber and the bill may pass or be stalled there before the Senate gets around to it.

Support of the bill is much stronger in the Senate committee than in the House group, where the latter voted it out by a margin of one vote. The Senate committee approved it by a vote of 11 to 4, after voting down a motion to postpone the measure indefinitely.

The majority report from the House committee emphasized that the bill carries out all major recommendations on natural-gas policy made last February by the cabinet fuels committee. But it also meets objections raised during the hearings by gas distributors and consumer representatives, and follows closely the recommendations of the Federal Power Commission.

Restates law . . . The report declared neither consumer nor public interest requires the regulation of gas producers as public utilities. It was not the intent of Congress to regulate the producers when it passed the Natural Gas Act. Except for additional controls given the FPC to protect consumer prices, the bill will write back into law what it had been generally believed was the law until the Supreme Court held otherwise last year.

"The exercise of federal jurisdiction for the purpose of regulating producers of natural gas as public utilities constitutes, it is believed, an extension of federal authority which is without precedent under our American system of free enterprise," the House was told.

"Producers of natural gas should be treated as what they are, namely, producers of a commodity like coal, oil or copper, not as public utilities. On this basis they should be exempted as is proposed in this bill."

The committee majority said that events since adoption of the Natural Gas Act have confirmed the view then held that competitive conditions in the producing areas make producer regulation unnecessary.

"The general level of field prices for natural gas has risen over the years, of course, just as prices generally have risen," the report said. "However, it appears obvious, when one considers the facts, that the forces of competition have kept natural-gas prices from getting out of line."

Gas good buy . . . The gas industry has grown phenomenally since 1938. And there is still a large unsatisfied consumer demand. Yet natural gas is gen-

Sohio Petrochemical Plant on Schedule

The first petrochemical venture by Standard Oil Co. (Ohio) is expected to be completed on schedule at Lima, Ohio. The 300-ton daily anhydrous ammonia unit is to be ready late in September. A 180-ton per day nitric acid unit will be added by November 1 and the urea unit is scheduled to be in operation in January 1956.

erally available to the consumer at a lower cost than the principal competing fuels, oil and coal, it was pointed out.

Consumer fears of unreasonable price increases received serious study, the report said. The committee felt there is sufficiently keen competition among gas producers to keep prices at a reasonable level, as it did for 16 years prior to the Phillips decision. But to make doubly sure, protective provisions against unreasonable field prices were written into the bill.

The committee explained that the standard of "reasonable market price" will take care of both new and renegotiated contracts and escalation clauses in existing contracts.

Exploration encouraged . . . The treatment of pipeline-produced gas in the same manner as purchased gas, adopted by the FPC in the Panhandle Eastern case in April 1954, will encourage the pipeline companies to expand their production operations, the report said.

"The interest of the public definitely lies in the direction of natural-gas production by pipeline systems themselves, as distinguished from their complete dependence for gas supply upon purchases from other producers.

"Such production by pipelines strengthens their bargaining position in negotiating gas purchase contracts with independent producers. By utilizing their own production to take the swings of pipeline-throughput in response to seasonal and other fluctuation of consumer demand, such pipeline systems are able to take their purchased gas at relatively uniform volumes. At high load factor, they thereby generally qualify for more favorable gas purchase prices."

Opponents heard . . . All arguments of the committee majority were attacked in the four minority reports. Reasonable market price means no regulation at all, one group said. Another report stated producers stand to collect "billions" if the bill is passed. It challenged the threat that price regulation would remove the incentive for exploration and development. The depletion allowance itself is an adequate incentive, it declared.

A third report held that the needs of producers for freedom from regulation could be met by exempting those with interstate sales of less than 2 billion cubic feet a year. The consumer interest would be protected by keeping effective the Supreme Court decision in the Phillips case. The fourth report did not object seriously to the Harris bill provisions. But it held that the FPC should have been given power to enforce "conservation" by controlling pipeline sales to industrial consumers.

WATCHING WASHINGTON

Bertram F. Linz

Canadian-Gas Plan Unique

Some rather unusual features have developed in the Pacific Northwest-El Paso plans for Canadian gas now before the Federal Power Commission.

For one thing: Pacific Northwest will buy the gas from Westcoast Transmission Co., Ltd., at a price which will not change during the 20-year life of the contract. The price is 22.5 cents per M.c.f. There is no escalation clause, provision for possible taxes, or any other "out."

For another: El Paso wants the FPC to decide which of three plans for taking gas from Pacific Northwest is best. This is the first time the commission has been asked to lay out a route, and there is some interest in whether the FPC will pick up the challenge.

There's a difference of $20,000,000 between costs of the cheapest and dearest plan, but El Paso says the important thing is to get the gas to California.

Still another: Westcoast Transmission isn't directly involved in the case because its operations will be entirely in Canada. But it is expected to make a full presentation before the FPC as to supply, costs, etc., just as though it were a party.

The Pacific Northwest-Westcoast deal calls for 300,000,000 cu. ft. of gas daily. This may be increased to 400,000,000 cu. ft. during the life of the contract. And Pacific Northwest believes the area it is to serve may be taking 1,000,000,000 cu. ft. a day before many years.

The contract arrangements are firm only until next December 11. If Pacific Northwest doesn't get the necessary import permit by that date, it may be necessary to make a new deal.

Gas New Target of Coal

The coal industry may soft-pedal its attack on residual fuel-oil imports and step up its drive against the competition of natural gas.

The reason—coal production is running considerably higher than in 1954. For the year it may be up 10 to 20 per cent. Right now the increase is pretty close to that of residual imports. The argument that foreign oil is continuing to cut into coal markets would be less persuasive.

But with legislation pending in Congress, the coal producers see a chance to lessen "unnatural gas competition." They want a cut in the advantages given gas by the Government. Among these, coal association officers say, are the federally protected state proration laws, the market monopolies given certificated transmission lines, and the exemption of the pipelines from price regulation on direct industrial sales.

The coal people can't do anything about the certificated pipelines. And they don't really think they can do anything about the state conservation laws. They are centering their effort chiefly on getting FPC regulations on industrial sales.

It would be in the interest of conservation to regulate industrial sales of gas, the coal producers say. It would, they claim, prevent the "dumping" of gas which West Virginia Sen. Harley M. Kilgore labeled the "most glaring waste." Their big talking point is that the reserve-life index of natural gas has dropped from 32 years in 1946 to 22½ years.

Tidelands Stew Boils

Who owns what along the Louisiana coast is a hot issue.

The Interior Department announced some weeks ago it would sell oil and gas leases on the Continental Shelf between the 3-mile and 3-league lines July 12.

Louisiana officials asked the department to pull these blocks out, as it did a year ago, until the Supreme Court could set the boundary. The department said "no."

Last month, then, the state said it would sell leases on the same areas on the same date.

Interior officials asked Gov. Kennon to pull these blocks out until the Supreme Court could act. If the governor says "no" there's a possibility they will ask the attorney general to get a Supreme Court injunction against the state. The court is in recess, but any justice could issue the stay order.

The department's position is that a federal Government claim is effective until the Supreme Court says otherwise. The state's position is that its claim is equally good until the court turns it down.

Import Curbs Studied

Texas independents demand immediate ODM controls; Gulf says oil imports already adjusted to proper 1954 ratio

WASHINGTON.—Plans for quick application of oil-import limitations—if they become necessary—are being studied by Mobilization Director Arthur S. Flemming.

Some domestic producers are saying immediate action is justified. They have asked Flemming to take steps under the national-security clause of the new Reciprocal Trade Act to cut imports to their 1954 ratio to domestic production. This was held last February by the cabinet fuels committee to be the proper balance.

A suggestion that Flemming call for quarterly reports from the major importers on their planned imports was offered by Senate Majority Leader Lyndon B. Johnson of Texas.

"This would give the ODM an up-to-date picture on petroleum imports at all times and would facilitate prompt action to restrict such imports when conditions warranted," Johnson said.

TIPRO asks controls . . . First demands for immediate controls came from the Texas Independent Producers and Royalty Owners Association. In a letter to Flemming, TIPRO asked him "to advise the President as soon as practicable that the national security is being jeopardized by the current rate of petroleum imports."

No further effort to determine the point at which imports begin or threaten to injury the national security is needed, Flemming was told.

TIPRO pointed out that action under the act may take the form of increased tariffs, quotas, any variation of the quota-tariff combination, import reductions by individual companies on a basis prescribed by presidential directive, or possibly otherwise. It offered to make specific recommendations if requested.

"Under this law, in our judgment, there can be no question as to the right and duty of the executive department to require by whatever means necessary that imports be reduced to the point which will assure that they do not exceed the level determined to be maximum consistent with our national security," the Texas group said.

"It is our conviction that importing companies cannot be depended upon to exercise necessary restraint even if it were the desire of each at all times to do so. . . . For that reason, some definite restrictive policy appears to us absolutely essential if the mandate of Congress and the findings of the President's committee are to be honored."

Gulf's position . . . This contention was disputed by S. A. Swensrud, chairman of the board of Gulf Oil Corp., one of the biggest importers.

He said oil importers generally are already complying with the recommendation that imports not exceed the 1954 ratio which he said amounted to 16.6 per cent of domestic production.

"The latest American Petroleum Institute figures indicate that total imports during the first 11 weeks of the second quarter—April 1 through June 17—were about 1,140,000 bbl. daily versus an average of 1,347,600 bbl. daily in the first quarter," the Gulf chairman said.

"These second-quarter imports were equal to approximately 17 per cent of concurrent United States crude-oil production, as against 20 per cent in the first quarter." He said this level could hardly be considered as significantly exceeding the proportion approved by the cabinet committee.

New Highway Program Asked

WASHINGTON.—Taxes of 3 cents per gallon on gasoline, 6 cents per gallon on diesel fuel, and 50 cents per pound on large tires would be imposed until 1970 to help finance a new highway construction program introduced in Congress last week.

The bill calls for spending $26 billion over the next 8 years. It was written by Democratic members of the House public works committee as a substitute for the administration program.

Oklahoma Plant Being Moved to Wyoming

CUSHING, Okla.—A 5,000,000 cu. ft. gasoline plant is being moved from here to Wyoming where it will be used to strip gas for a pilot pressure-maintenance program in Greater Clareton oil field. The plant, formerly operated by Boswell-Frates Co. in Sporn field near here, is being dismantled for the 1,000-mile truck trip to Newcastle, Wyo. It was purchased recently by Tri-Co. Gas Co., jointly owned by Voss Oil Co., Wynton Oil & Gas Co., and Rosebud Oils, Inc. *(The Oil and Gas Journal, June 6, page 86).*

A Tulsa engineering firm, Marsh Co., was hired to supervise the teardown, move and reerection. The $500,000 plant is to be placed in operation in September. The Greater Clareton Producers Committee also is considering plans for one or more gasoline plants to process gas flared in the field. Wells producing more than 5,000 cu. ft. of gas per barrel of oil have been ordered shut in until July 31.

The Wyoming Oil and Gas Commission extended its order from July 1 to permit completion of a survey of gas-oil ratios by Core Laboratories, Inc. The commission will meet after the report is completed July 15 to consider a permanent order. Core said 132 of the 566 wells tested so far had excessive gas-oil ratios. There are about 615 wells in the field. Core Lab recommended study of both water and natural-gas injection into the field as possible means of prolonging its life.

War Line Studied

Need for oil carrier to West Coast to be probed

WASHINGTON. — A congressional study of the need for pipeline oil transportation to the West Coast will open here this week.

Rep. F. Edward Hebert of Louisiana will head a House armed services subcommittee which will start hearings July 7. First witnesses will be officials of the Defense Department, Office of Defense Mobilization, Office of Oil and Gas, and other interested agencies.

The hearings will move to Los Angeles July 11 to take testimony from West Coast oil and other interests.

Hebert said the big question before his subcommittee will be whether West Coast petroleum supplies are "adequate" to meet wartime needs. The main points to be studied are:

. . . **Sources of crude** and products to meet military and other requirements of the area.

. . . **The amount of crude** and products needed to meet ordinary military and other demands.

. . . **Whether adequate supplies** of crude and products will be available on the West Coast to meet all military and other requirements during a national emergency.

The inquiry was sparked by Rep. Dewey Short of Missouri. Short charged the West Coast would have a severe shortage of oil in an emergency. He said it is importing 50,000 bbl. daily from abroad even now.

Short said the government agencies have been "dragging their feet" on the question of a pipeline to the Pacific Coast. Recently, he said, they have changed their minds. Now the Defense Department favors the line, he claimed, realizing that planes, ships and bases would be useless in wartime without an oil supply.

A pipeline from Texas to the West Coast has long been proposed by L. M. Glasco of West Coast Pipe Line Co., Dallas. The project has been held up by lack of government support which Glasco said was necessary.

Alaska Seeks Tidelands

WASHINGTON.—A bill giving Alaska the same rights to submerged oil and other resources along its coasts as have been given the states was introduced in Congress last week by Delegate E. L. Bartlett.

The bill gives the territory all rights over its navigable nontidal waters and over its seacoasts out to 3 miles.

The territorial legislature would be given the right to manage, lease, and develop the oil, gas, and other resources of these submerged areas. Resources beyond the 3-mile limit would remain in the possession of the federal Government.

Gas Price Approved

FPC examiner refuses to limit new sales contract

WASHINGTON.—A Federal Power Commission examiner refused last week to limit the price of gas in a new sales contract to the price now charged for other gas in the same area.

His decision approves a contract under which Signal Oil & Gas Co. will sell up to 45,000,000 cu. ft. of gas daily to Cities Service Gas Co. at a price of 12 cents per thousand feet.

Oklahoma Natural Gas Co. and Lone Star Gas Co. asked Examiner William J. Costello to ban any price above 10 cents, the going price in the field. They said a higher price would trigger increases under favored-nation clauses in other contracts. The FPC staff also opposed the 12-cent price, asserting that Signal would earn between 8 and 16 per cent on its investment with the 10-cent price.

Costello pointed out that no producers who sell to Lone Star would be able to avail itself of an escalation clause without the filing of a rate schedule with the FPC. Oklahoma Natural is a wholly intrastate company and should seek relief from the Oklahoma Legislature rather than the federal agency, he said.

Reasoning questioned . . . So far as the staff contention of earnings is concerned, Costello said, there is question whether it would provide a basis for a conclusion that the 12-cent price is not "just and reasonable." It could be argued that even the 10-cent rate is excessive. But if there is to be any rate condition at all it should not be based on the proposition that the present area sales price, whatever it happens to be, is, without further proof, just and reasonable.

The unsettled state of the law and its administration, Costello commented, makes the decision process "a somewhat frustrating activity."

Costello pointed out that if the 12-cent rate is challenged it can be studied by the FPC in a regular rate case. But, he added, "all of the problems which would be created by a (price limiting) condition in the certificates sought herein seem to outweigh the problems which would be created by the issuance of certificates without such condition."

Refining Briefs

SALT LAKE CITY.—Utah Oil Refining Co. has contracted with Fluor Corp., Ltd., to build a 5,500-bbl. per day Ultraforming unit at its 29,000-bbl. refinery here. The unit is scheduled to go on stream early next year. It will process a heavy naphtha fraction to produce high-octane gasoline blending stock. The reformer will use a platinum-type catalyst in a regenerative type of operation developed and licensed by the affiliated Standard Oil Co. (Ind.).

ARKANSAS CITY, Kans.—A new 5,000-bbl. per day Platformer will be added to the Anderson-Prichard Oil Corp. refinery here. Construction contract for the $750,000 unit has been let to Southwestern Engineering Co., of Los Angeles. The unit is designed to permit its conversion to a Rexforming unit if and when additional octanes are required. Rexforming and Platforming are licensed by Universal Oil Products Co. Rexforming incorporates facilities for the extraction of low-octane components from the Platformate, and recycling them through the catalytic reforming operation. It enables production of a 100-octane number product.

MONTREAL.—Canadian Petrofina, Ltd., whose modern 20,000-bbl. refinery is nearing completion here, has extended marketing activity into the Maritimes of Canada. An agreement with United Service Corp. gives the company about 400 new service station outlets in Nova Scotia, New Brunswick, and Prince Edward Island. Canadian Petrofina's goal is some 925 stations in Quebec and Ontario by the end of 1955, all selling "Fina" and "Super-Fina" brands.

PITTSBURGH.—North American rights to design, construct, and license plants to use the "L'Azote" ammonia process have been assigned to Koppers Co., Inc. The process combines atmospheric nitrogen with hydrogen from natural gas, refinery gas, catalytic reformers, or coke ovens to form synthetic anhydrous ammonia. Henry A. Denny, Koppers vice president, said hydrogen from coke-oven gases produced in the United States is sufficient to turn out 11,000,000 tons of ammonia per year if made available for that purpose.

CUSHING, Okla.—Construction contract will be let this month for a 3,000-bbl. daily Platformer at the Midland Cooperatives, Inc., refinery here. The unit is scheduled to go on stream early next year.

Magnolia Finishes Line

215-mile Midland to Corsicana crude carrier laid in 2½ months, gives company two big lines from Permian basin

DALLAS.—Magnolia Pipe Line Co. was within a few feet last week of completing all pipe laying involved in the current expansion of its crude system between Midland and Corsicana, Tex.

Only about 400 ft. of the 215 miles of 12, 14, and 16-in. line remained to be laid south of Abilene. This was expected to be in the ground by the end of the week.

O. R. Burden Construction Corp. and H. B. Zachry Co., the contractors, working from the ends toward the center, took only 2½ months to complete the job.

Though the line is in the ground, it probably won't be in full operation until mid-August. A Magnolia Pipe Line official said last week that the section from De Leon to Corsicana will start taking crude about mid-July, the remainer about August 15. The lag is due to a wait on pumps.

By placing the entire line in operation by mid-August, however, Magnolia will still be a month and a half ahead of its October 1 target date.

The company now operates a 335-mile, 12-in. line, looped in places, and an 8-in. line between Midland and Corsicana. The new work has filled in the gaps between loops and will give the company two complete lines of 12 in. and larger between the two towns.

The new pipe, plus the addition of more horsepower at existing pump stations, will hike Magnolia's capacity out of the Permian basin from the present 128,000 bbl. to 162,000 bbl. daily.

The company has six pump stations along the route of the line at Midland, Iatan, Sweetwater, Clyde, De Leon, and Walnut Springs. Each has two centrifugal pumps driven by 900-hp. motors, for a total of 10,800 hp.

The expansion will double this total to 21,600 hp. The complete new line will have the same equipment as the older artery and will be operated separately.

Magnolia also will build a new pump station at Groveton, Tex., on the 20-in. trunk line it completed last year from Corsicana to its Beaumont refinery. Completion of the Groveton station will raise capacity of this line from 130,000 bbl. to 165,000 bbl. daily and permit handling increased throughput from West Texas. The station will have

two centrifugal pumps driven by 1,500-hp. motors.

Product-line start . . . Completion of the work on the new crude line will idle the 8-in. line from Midland to Corsicana.

As soon as crude starts moving through the 12 to 16-in., Magnolia will convert the 8-in. to L.P.G. service *(The Oil and Gas Journal, April 21, page 131)*. The line will pipe up to 25,000 bbl. a day of unfractionated natural gasoline and L.P.G. to Corsicana where it will enter a 10-in. carrier for shipment on to Beaumont.

Magnolia already has contracts to take products from the Pegasus Unit gasoline plant which it operates in Pegasus field and from El Paso Natural Gas Co.'s Midkiff plant in Spraberry Trend Area field. It has been negotiating other contracts.

The L.P.G. stream then will be separated into various products in new facilities at the Beaumont refinery. Butane and propane will move through existing lines to the company's underground storage operation at Hull, 30 miles west of Beaumont. Natural gasoline will be processed at the refinery.

New pump stations may be built on the 8-in. at Iatan and De Leon. All conversion work, including revamping and building pump stations, will be handled by company personnel. Company officials think the line will start carrying products about the first of the year.

Texas Firms Plan Merger

HOUSTON.—Plans for merger of Johnston Oil & Gas Co. and Texam Oil & Gas Co. were revealed last week.

W. Stewart Boyle, Texam president, said the proposal probably will be submitted to stockholders within a few days.

Boyle estimated that the annual gross income of the merged firms would total about $1,600,000.

Johnston Oil & Gas, headed by Ralph A. Johnston, owns an interest in leases totaling about 89,000 acres in the San Juan basin area of New Mexico in addition to other leases in New Mexico and Colorado. Texam owns a working interest in about 120 producing oil wells and several gas wells in Texas. It also has nonproductive leases covering about 145,000 acres in Texas, Louisiana, New Mexico, Colorado, Wyoming, Nevada, and Utah.

Texas U. Bids High

Magnolia tops offers as school nets $7,447,500

AUSTIN. — Spirited bidding at the twenty-fifth public auction of oil and gas leases on University of Texas lands here last week netted the university nearly $7,500,000.

Operators paid $7,447,500 for leases on the majority of the 149 tracts, which totaled 56,392 acres.

Bonuses averaged about $132 per acre.

Magnolia Petroleum Co. topped all bids with its offers of $700,000 for a 2,638.8-acre drilling block in southeastern Upton County. A requirement that the leasing firm drill an Ellenburger wildcat to 11,700 ft. went along with this lease.

Second highest bid was Texas Pacific Coal & Oil Co.'s offer of $550,000 for a 2,301-acre block in Crockett County. This one also called for an Ellenburger wildcat.

Texaco big spender . . . Several other tracts went for more than a quarter of a million dollars. One of these was tract 43, 326.8 acres in northern Crane County, for which The Texas Co. paid $360,000.

Texaco was the big spender at the auction. The company was high bidder on nine tracts in Crane, Andrews, Ector, and Loving counties for which it paid a total of $1,403,500.

All of the 149 tracts but two were in West Texas. These two were in Cooke County, North Texas.

The money which the university took in from the sale swelled its total take from sales of oil and gas leases to more than $120,000,000.

New Line Idea

Compromise suggested for all-Canadian gas pipeline

WINNIPEG.—Officials of Winnipeg & Central Gas Co. have suggested a compromise proposal which they claim would insure ultimate construction of an all-Canadian natural gas pipeline from Alberta to the east.

The plan involves building a trunk line from Alberta to the head of the Great Lakes with a spur to Duluth to feed into a proposed line of Tennessee Gas Transmission Co.

In eastern Canada, a line would be pushed from Toronto to Sudbury and would be fed by supplies from the United States. The deal would involve a trade whereby 500,000,000 cu. ft. of Alberta gas would be fed into Tennessee lines daily and an equal amount would be delivered to eastern Canada daily from the United States.

Trans-Canada's latest plan, to build its line from Alberta to Winnipeg and south to Emerson, Man., would mean that only 700 or 800 miles of the all-Canadian project would be completed in initial stages.

The Winnipeg company claims its proposal would insure construction of between 1,200 and 1,400 miles of the all-Canadian line leaving a gap of only 600 miles between the lakehead and Sudbury.

Pembina Boom Roars On

CALGARY.—With improved road conditions, exploration drilling activity has increased to a near frantic pace in Pembina field, which bids to become Canada's greatest.

More than 40 rigs were operating last week. Others were moving to new locations.

A month ago only 14 rigs were active in the field. Bad roads held up work at 18 other locations.

Gas-Supply Lines Planned

EDMONTON.—Two pipelines will be built to carry gas to a pulp mill now under construction near Hinton, 175 miles west of here. They will be finished by the fall of 1956.

North Canadian Oils, Ltd., of Calgary will lay a 136-mile, 10-in. line from Wabumun to Hinton. Maximum capacity will be 60,000,000 cu. ft. daily but initial flow is expected to be about 10,000,000 cu. ft. Mid-Western Industrial Gas, Ltd., of Edmonton, which with North Canadian will supply gas to the mill, will build a line from its gas fields in the Alexander, Majeau Lake, and Westlock districts to Wabumun.

Water Injection Studied

REGINA, Sask.—The effect of water injection on production will be studied in the Lloydminster, Smiley, and Wapella oil fields of Saskatchewan.

The Saskatchewan Department of Mineral Resources has approved the designation of certain wells as salt-water disposal wells. Brine produced with oil in the three fields will be returned to producing zones.

So Near and Yet So Far

This storage tank appears to be conveniently located for The Texas Co.'s I T. F. Cruse, which was drilled on the tract occupied by the company's bulk station at Hull, Tex. But the storage isn't as handy as it seems. Production from the well, which produces at the rate of 356 bbl. daily, must be moved by pipeline to the Texaco refinery at Port Arthur, about 40 miles away, before going to the station in the form of gasoline or other products.

Canadian Briefs

REGINA, Sask.—Federal charters as pipeline companies have been granted S & M Pipeline, Ltd., a subsidiary of Canadian Devonian Petroleums, Ltd., and Westspur Pipeline Co., a subsidiary of Imperial Oil, Ltd. Both companies propose to build 100 miles of crude-oil lines to run from southeastern Saskatchewan to a pump station on the Interprovincial Pipe Line at Cromer, Man. They would carry crude from the Alida - Frobisher - Nottingham - Midale fields. The Board of Transport Commissioners must approve the line before construction can begin. Trans Prairie Pipe Lines, Ltd., also is seeking a permit to build a similar line.

EDMONTON, Alta.—American Leduc Petroleums, Ltd., of Edmonton has completed a merger agreement giving it the assets and undertakings of Antone Petroleums, Ltd., of Toronto. Antone's holdings will be exchanged for 1,400,000 shares of American Leduc. Antone has interests in commercial oil wells in Alberta and the United States and has nine capped gas wells in Alberta.

EDMONTON, Alta. — Tennessee Gas Transmission Co., which may join with Trans-Canada Pipe Lines, Ltd., in a two-way plan to pipe natural gas to eastern Canada, will enter the oil and gas exploration and discovery race in Alberta. The company will drill its first exploratory well under a farmout agreement with California Standard in the Consort area, 80 miles southeast of Stettler. The well will be an extension from the southwest limits of Provost-Consort gas field. Tennessee Gas recently purchased controlling interest in Bay Petroleum Corp., Denver, which had wells at Leduc, Redwater, Joarcam, Erskine, and Rimbey.

WINNIPEG.—Dome Exploration (Western) Ltd. paid a cash bonus of $7,556.66 for a lease of 3,200 acres of wildcat acreage in a Manitoba crown sale. The lease carries a commitment for one well to a minimum of 4,100 ft. within 6 months.

CALGARY.—Imperial Oil, Ltd., has opened its $1,000,000 oil-research laboratory in Calgary's Manchester industrial area. The laboratory has electronic computers, said to be the only ones of their kind in Canada, to solve involved mathematical problems instantly. An electronic reservoir analyzer will be used to predict oil-well behavior.

WYOMING GOV. MILWARD SIMPSON, long associated with the oil industry as a director of Husky Oil Co., cuts the ribbon opening the first Rocky Mountain Oil Show at Casper. With him are Gov. Ed Johnson, Colorado, center, and Gov. Norman Brunsdale, North Dakota, right. They are getting an assist from Lindy and Les Mallory, children of Robert W. Mallory, publicity director of the show and division manager for Chicago Corp.

$10 Million in equipment at . . .

. . . Rocky Mountain Show

CASPER, Wyo. — Major oil field equipment manufacturers displayed more than $10 million worth of equipment at the Rocky Mountain Oil Show staged here June 23-26. It was the first such trade show ever sponsored in this fast growing oil province.

Displays of 150 exhibitors attracted operating men from all sections of the Rocky Mountain area. They examined tools ranging in size from small couplings to a trailer-mounted drilling rig.

Three governors participated in opening ceremonies. Wyoming Gov. Milward Simpson was joined by Govs. Ed Johnson, Colorado, and Norman Brunsdale, North Dakota. The show was modeled after the Permian basin show at Odessa, Tex. It even featured a Texas barbecue by the Odessa Chuck Wagon Gang, which was making its first appearance outside of Texas.

Several exhibitors representing companies just entering the Rocky Mountain area reported they particularly were pleased with results of the show. One of the largest indoor displays was shown by Dresser Industries, Inc., which picked the show for its first entrance into a regional exhibit.

Display winners . . . Prizes were given for the best displays. In the indoor division, Robert K. Cooper, Casper, was judged best. Second and third places went to Fred S. Dewel Specialty Co., and LeRoy Mitchell, both of Casper.

The Gehring Equipment Co. display featuring a Wilson trailer-mounted drilling rig won the outdoor exhibit prize. Gehring is a Casper supply house. Halliburton Oilwell Cementing Co., Duncan, Okla., and Moulden Oilfield Equipment Co., Casper, won second and third in outdoor exhibits.

Special visitors to the show included 40 engineering students from Colorado School of Mines, Golden. They are spending 6 weeks at a summer camp at Rangely, Colo. Part of their schedule called for 1 week visiting oil-field installations in the Rockies, and the show visit was part of the week's activities.

The show was organized under direction of James E. Emrick, Casper specialty-house owner. Vice chairman of the show was J. J. Oldham, contract representative for R. L. Manning. Show manager was Darrel Boorth, secretary of the Casper Chamber of Commerce.

TRAILER-MOUNTED RIG, left, won first place in the outdoor exhibits at the Rocky Mountain Oil Show.

Reinjection Order Voided

DENVER.—Natural gas produced from the Weber sand reservoir of huge Rangely field will not have to be returned to the reservoir.

This is the effect of a decision last week by the Colorado Supreme Court. The court refused to grant a rehearing on its mid-May ruling that the state Oil and Gas Conservation Commission exceeded its authority in requiring the reinjection of gas in the state's largest oil-producing area *(The Oil and Gas Journal, May 23, page 95)*.

The May ruling vacated a June 20, 1952, commission order which was attacked by The Texas Co., Union Pacific Railroad, and Sharples Oil Co. The commission action had been upheld in District Court here. The commission was supported by Phillips Petroleum Co., the California Co., and Stanolind Oil & Gas Co.

Rangely has 478 producing wells with daily production of 66,500 bbl., almost half the state's present average of 140,000 bbl. daily. The wells have been producing about 39,000,000 cu. ft. of gas daily, with 20,000,00 cu. ft. being flared.

Lease Cancellation Eased

HELENA, Mont. — The Montana Land Board will not arbitrarily cancel leases — as it threatened earlier — if holders do not test for oil and gas within the first 2 years.

The board last week modified its mid-June announcement in the face of loud protests from the oil industry and threatened litigation. It voted to include in leases granted in July and later a provision preventing operators from continuing leases after 10 years by paying the nondrilling penalty. The specification applies if an adjoining tract is producing oil or gas.

The oil industry contended the board lacked authority, under a 1955 legislative act, to terminate leases any time in the first 6 years *(The Oil and Gas Journal, June 27, page 78)*.

Conservation Law Sought

LINCOLN, Neb.—Gov. Victor Anderson wants the 1957 legislative session to enact reasonable regulations to conserve Nebraska's oil and gas resources.

He called for a study of proposed laws last week after noting some fields in the Sidney area are already going dry. The session just ended killed conservation measures which foes said would "cripple an infant industry."

The state's crude-oil production is about 30,000 bbl. daily.

Minnesota Farmland Grows . . .

. . . New 25,000-bbl. Refinery

ST. PAUL. — Approximately 1,000 workers are busy putting finishing touches on Great Northern Oil Co.'s 25,000-bbl. refinery 12 miles south of here. The plant is scheduled for completion in August.

Originally the plant was scheduled to process only medium-gravity crude from Fosterton field in southwest Saskatchewan. This supply will come from Socony-Vacuum Exploration Co., Woodley Petroleum Co., and Southern Production Co. It has been reported crude also will come from production now owned by Imperial Oil, Ltd., in southern Saskatchewan. Imperial reportedly is selling the crude to Shell Oil Co., Ltd., for sale to Great Northern.

Crude from Fosterton field started moving in June through 856 miles of pipelines that will serve the refinery. Two new lines were built as part of the pipeline system. They were South Saskatchewan line from Fosterton field to Regina and Minnesota pipeline from Clearbrook, Minn., to Great Northern's tank farm near Hastings, Minn. The crude moves through the Interprovincial-Lakehead pipeline between Regina and Clearbrook.

Dominating the aerial view of the refinery (lower photo) is a 12,000-bbl. Thermofor catalytic cracker. In the foreground is a 450-ton delayed coking unit.

Principal stockholders in Great Northern are Woodley Petroleum and Southern Production.

Output Still Rising

April increase most moderate in months; record levels in Middle East offset by sharp drop in Canadian production

THE upward spiral of free world crude production continued in April, but the new record level was the most moderate increase in 7 months.

Crude production, exclusive of Russia and other Communist countries, averaged 13,694,000 bbl. daily in April, 32,200 bbl. daily over the previous month. The increase resulted from an over-all rise of 79,700 bbl. daily, to a new record level of 3,327,600-bbl. daily in the Middle East.

This offset a decline of 50,100-bbl. daily in the Western Hemisphere outside the United States, caused by a drop of 50,000 bbl. daily in Canada. Production there averaged 262,000 bbl. daily, off 16 per cent from March. Canada's lower output was due to reduced allowables in Alberta.

United States production increased 1,000 bbl. daily for another all-time high of 6,887,000 bbl. daily.

A year ago, free world output dropped sharply in April. The total crude produced was off 104,100 bbl. daily from an earlier all-time high of 12,379,200 bbl. daily in March 1954.

Still rising . . . On a 4-month basis, total free world production this year averaged 13,512,000 bbl. daily, up 1,360,000 bbl. daily, or 11.2 per cent from last year.

Nearly half of this increase was accounted for by the Middle East. For the first 4 months of 1955, Middle East production averaged 3,158,700 bbl. daily, against 2,613,000 bbl. daily in 1954. The increase of 545,700 bbl. daily amounted to about a 21 per cent rise in production for the area.

In April, production in Saudi Arabia dipped 38,400 bbl. daily to 979,000 bbl. daily from the preceding month. But this decrease was more than balanced by new all-time highs in both Kuwait and Iraq. Output in Kuwait reached 1,179,300 bbl. daily to exceed the previous record set in October 1954. Production in Iraq averaged 699,500 bbl. daily, for a new record the second month in a row. Output was up 25,300 bbl. daily, or 3.7 per cent over March. The increase was chiefly due to record output by Basrah Petroleum Co., Ltd., which produced 162,200 bbl. daily from Zubair field and from the newly developed Rumaila field 20 miles to the west.

Shipping increased . . . Crude deliveries from Mediterranean ports also continued at a high level. Trans-Arabian Pipe Line Co. said that crude delivered from Sidon, Lebanon, averaged 316,702 bbl. daily during the first 4 months of the year. This compared with an average of 297,070 bbl. daily during the same period last year. In April, deliveries averaged 328,050 bbl. daily.

Iraq Petroleum Co., Ltd., announced that in April 79 tankers took shipments averaging about 340,000 bbl. daily from the pipeline terminal at Banais, Syria. Exports from Tripoli, Lebanon, averaged about 125,000 bbl. daily. Thirty-two tankers were loaded at the port during the month.

In Venezuela, production during the first 4 months averaged 2,137,600 bbl. daily, against 1,879,300 bbl. daily during the same period in 1954. The 258,300 bbl. daily increase was a rise in output of 13.7 per cent over the previous year. April production in Venezuela of 2,146,100 bbl. daily was within 3,900 bbl. daily of the all-time record set in February. The output was up

TREND OVER THE LAST YEAR

1954—	W. Hemisphere less U. S.	Middle East	Total, non-Communist countries
April	2,565.3	2,646.0	5,660.4
May	2,639.3	2,766.0	5,863.8
June	2,648.5	2,685.0	5,805.5
July	2,667.0	2,758.7	5,890.9
August	2,663.7	2,749.5	5,891.9
September	2,704.5	2,702.2	5,879.2
October	2,750.0	2,898.6	6,141.6
November	2,856.5	2,844.6	6,193.6
December	2,957.7	3,001.8	6,453.3
1955—			
January	3,001.5	2,950.1	6,442.5
February	3,050.4	3,109.3	6,653.8
March	3,036.0	3,247.9	6,775.8
April	2,985.9	3,327.6	6,807.0

CRUDE-OIL PRODUCTION

(Daily average in thousands of barrels)

Country—	April 1955	March 1955	April 1954
W. Hemisphere:			
Argentina	80.0	79.5	81.2
Bolivia	6.5	6.5	6.5
Brazil	6.0	5.5	2.1
Canada	262.0	312.0	179.2
Chile	6.3	6.0	4.5
Colombia	105.2	106.5	111.3
Cuba	0.7	0.7	0.1
Ecuador	9.1	9.4	8.4
Mexico	250.0	250.0	235.0
Peru	47.0	47.9	47.1
Trinidad	67.0	67.2	63.8
Venezuela	2,146.1	2,144.8	1,829.2
Total	2,985.9	3,036.0	2,565.3
W. Europe and Africa:			
Algeria	1.2	1.2	1.6
France	12.3	12.3	7.2
Fr. Morocco	2.3	2.3	2.6
W. Germany	59.5	57.8	49.6
Italy	3.2	2.9	1.6
Netherlands	19.5	19.1	17.5
Egypt	33.3	33.3	38.9
United Kingdom	1.2	1.2	1.2
Total	132.5	130.1	120.2
Middle East:			
Bahrain	30.0	30.0	30.1
Iran	299.8	300.8	47.9
Iraq	699.5	674.2	606.5
Kuwait	1,179.3	1,086.7	900.4
Neutral Zone	24.0	24.0	8.0
Qatar	113.4	112.2	97.8
Saudi Arabia	979.0	1,017.4	954.6
Turkey	2.6	2.6	0.7
Total	3,327.6	3,247.9	2,646.0

Country—	April 1955	March 1955	April 1954
Other Asia:			
Brit. Borneo	99.0	99.0	98.8
Burma	3.7	3.7	3.5
India	7.0	7.0	6.8
Indonesia	230.0	230.0	196.8
Japan	5.9	6.0	5.7
New Guinea	10.1	10.8	12.1
Pakistan	5.3	5.3	5.2
Total	361.0	361.8	328.9
Total non-Communist foreign	6,807.0	6,775.8	5,660.4
United States	6,887.0	6,886.0	6,614.7
Total, Free World	13,694.0	13,661.8	12,275.1
Communist-controlled countries:			
Russian occupied zone of Austria	57.5	57.5	62.0
Romania	125.0	125.0	110.0
Russia	1,235.0	1,235.0	1,135.0
Others	36.8	36.8	34.1
Total	1,454.3	1,454.3	1,341.1
World total	15,148.3	15,116.1	13,616.2

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Estimates also have been made for other countries, particularly in Southeast Asia, where completely current reports are lacking. Other Communist includes China and Yugoslavia as well as the Soviet satellite countries in Europe.

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slightly, by 1,300 bbl. daily, from March.

Two other South American countries showed slight declines. Production in Colombia was off 1,300 bbl. daily to 105,200 bbl. daily. Output in Ecuador was off 300 bbl. daily to 9,100 bbl. daily.

In Europe, two countries reported new production records. Germany set a new high for the second month in a row. Output in April averaged 59,500 bbl. daily, an increase of 1,700 bbl. daily, of 2.9 per cent over the March high. In Italy, output rose 300 bbl. daily to 3,200 bbl. daily to pass the 3,000 bbl. mark for the first time.

Foreign Firm Sold

Texans head group buying into Venezuelan company

A GROUP of Texas oil operators and eastern financiers has bought controlling interest in Venezuela Syndicate, Inc., a royalty company with large holdings in Venezuela.

Purchasers include Clint W. Murchison, Dallas; Cecil V. Hagen, Houston; Roy B. Kelly, Washington; and G. L. Ohrstrom & Co., New York. The same group recently acquired control of Toklan Oil Corp., Tulsa.

Venezuela Syndicate's South American holdings include royalty in 795,000 acres on Mene Grande Oil Co. concessions and 71,341 acres of Royal Dutch-Shell concessions. In addition, the company has Venezuelan concessions covering 6,200 acres, producing royalty in the East Texas field, and interests in West Texas.

H. Harper McKee, president, and other officers and directors of the company plan to resign, a spokesman for the purchasing group announced.

The group also owns Talon Petroleum, C. A., Venezuelan oil producer, and Falcon Petroleum Corp., domestic producing company, and it has a large interest in Gulf Coast Leaseholds, Inc., Houston.

Esso Will Install Computer

Esso Petroleum Co., Ltd., plans to install an electronic computer at its Fawley, England, refinery.

The computer will evaluate punch cards with data on the required amounts of finished products, the quantities of various types of crude on hand, and stocks of intermediate and finished products.

The machine will then print the rates at which crude should be fed into distillation units and at which fractions should be fed into other plants for further treatment. The computer also will give the proportions in which intermediate products should be blended, and the production rate and quality of finished products.

By electronic analysis of production, the company plans to free chemical engineers from routine calculating work, and minimize production surpluses and deficiencies.

The New and the Old in Land of Pharoahs

This Egyptian-American Oil Co. rig is a curious sight to camel caravans on the Western Desert of Egypt, about 50 miles southwest of Alexandria. Egyptian-American, a subsidiary of Continental Oil Co., is drilling at about 1,000 ft. at the wildcat. It is the first test on a 50,000,000-acre concession granted by Egypt last year to Conoco, Cities Service Co., Ohio Oil Co., and Richfield Oil Corp. The Conoco subsidiary is operator for the group. The test is projected to 15,000 ft. unless oil is found at a shallower depth. Thousands of land mines planted during historic World War II battles between Hitler's Afrika Corps and the British Eighth Army still lie hidden in the desert sand surrounding the well site. A crew of mine-clearing experts has been assigned by Egyptian-American to a separate department to remove the hazards.

Unifining Unit on Stream

The first Unifining unit outside the United States has gone on stream in an Australian refinery. The unit is at the 6,500-bbl. daily plant of Bitumen & Oil Refineries, Ltd., in Matraville, New South Wales.

The design will permit expansion to operate on a blocked-out basis to handle light aromatic oils. Aromatics could subsequently be recovered as an alternate operation to the desulfurization of diesel oil. These would include nitration-grade benzene, toluene, and xylenes.

The unit is a part of an extensive expansion program at the refinery. A 10,000-bbl. daily atmospheric distillation unit is being added this year. A 1,500-bbl. Platformer is being expanded to 2,500-bbl.

Equipment Men Organize

Petroleum equipment manufacturers in Europe have formed an organization to coordinate technical information in Germany, Belgium, France, Italy, and the Netherlands.

D. WILSON

The organization, headquartered in Paris, is the Federation of European Petroleum Equipment Manufacturers (FEPEM). Douglas Wilson of London is chairman. Jean-Pierre Le Gall of Paris is secretary. To draw attention of the world market to European equipment, the FEPEM participated in the Fourth World Petroleum Congress in Rome, June 6-15, as well as in the International Petroleum Equipment Exhibition in Naples.

It will help organizations in member countries to promote research and generally contribute to new technical developments. Members also will work toward solution of international economic problems affecting the petroleum-equipment industry.

F. R. Kelly, Costain-John Brown consultant, left, heads a delegation from London which conferred last week with Williams Brothers officials. Others, left to right, are David Williams, Williams Brothers vice president; R. Riley, C-JB instrumentation engineer; B. E. Barnes, Williams vice president; and C. M. Collins, Williams chief engineer.

Iranian Line Contractor Confers in U. S.

WILLIAMS BROTHERS CO., Tulsa, will advise Costain-John Brown, Ltd., on technical aspects involved in building the new 10-in. products line in Iran.

Costain-John Brown is one of two principal contractors on the 573-mile, 10-in. line to be built for National Iranian Oil Co. It will move Abadan refinery products from Ahwaz, near Abadan, to Teheran.

As now planned, the line will begin operations with five pump stations and an initial capacity of about 20,000 bbl. a day. A second phase of construction sometime in the future will add five more pump stations and increase capacity to about 30,000 bbl. per day.

Construction is to begin in September and be completed by the end of 1956 *(The Oil and Gas Journal, April 25, page 100).*

Costain-John Brown will build the 337-mile southern section of the line. The route here rises from 60 ft. to an elevation of nearly 7,000 ft. at Razan pass. Four pump stations will be built on this section.

The other principal contractor, Entrepose, a Paris firm, has the 236-mile section into Teheran, which has an elevation of about 4,500 ft. One pump station will be built on this portion of the line. All stations will be equipped with diesel engines and centrifugal pumps.

Last week a four-man team of Costain-John Brown officials was in Tulsa conferring with William Brothers officials on problems involved in building the line. The group was headed by F. R. Kelly, consultant, and R. Riley of the company's instrumentation department.

Cameroons Test Hits Gas

A test well in the French Cameroons has found a show of high-pressure natural gas.

The well struck gas at about 5,840 ft. at a location near the village of Logbaba in the Doula area. It was drilled by Ste. D'Etudes et de Recherenches du Petrole du Cameron. The firm has carried on exploration work in the West African mandate since 1952.

The well was spudded April 10. The rig was moved to the location from Malemba about 25 miles southeast of Doula where an earlier test was abandoned.

Corrosion Society Formed

A European Federation of Corrosion has been formed to foster research and exchange information on metal protection among scientists of eight nations.

The organization was formed during the convention of chemical technology held in Frankfort, Germany. Thirty-three technical and scientific societies were represented from Germany, France, Italy, Luxemburg, Austria, Sweden, Switzerland, and Spain. The federation move climaxed convention discussions on the phenomena and causes of corrosion.

The move is the second important advance toward closer European cooperation in the field of science and technology. Two years ago a European Federation of Chemical Engineers was formed.

The federation on corrosion will have two offices. One is at the Societe de Chimie Industrielle, 28 Rue Saint Dominque, Paris (7e); and the other at DECEMA (Deutsche Gesellschaft fur chemisches Apparatewesen), Frankfort /M, Rheingau-Allee 25, Western Germany.

Cabeen Studies Australia

Wm. Ross Cabeen & Associates is evaluating a 7,000,000-acre concession in Queensland, Eastern Australia, for Western Petroleum Exploration Corp., subsidiary of Western Drilling Co., Lubbock, Tex.

Dick Mead, formerly a geologist with Shell Oil Co. at Casper, Wyo., is director of the Australian project for Cabeen. Burdette A. Ogle, division manager at Denver, said the study probably will require 6 months to a year because a large portion of the concession extends into the tidelands.

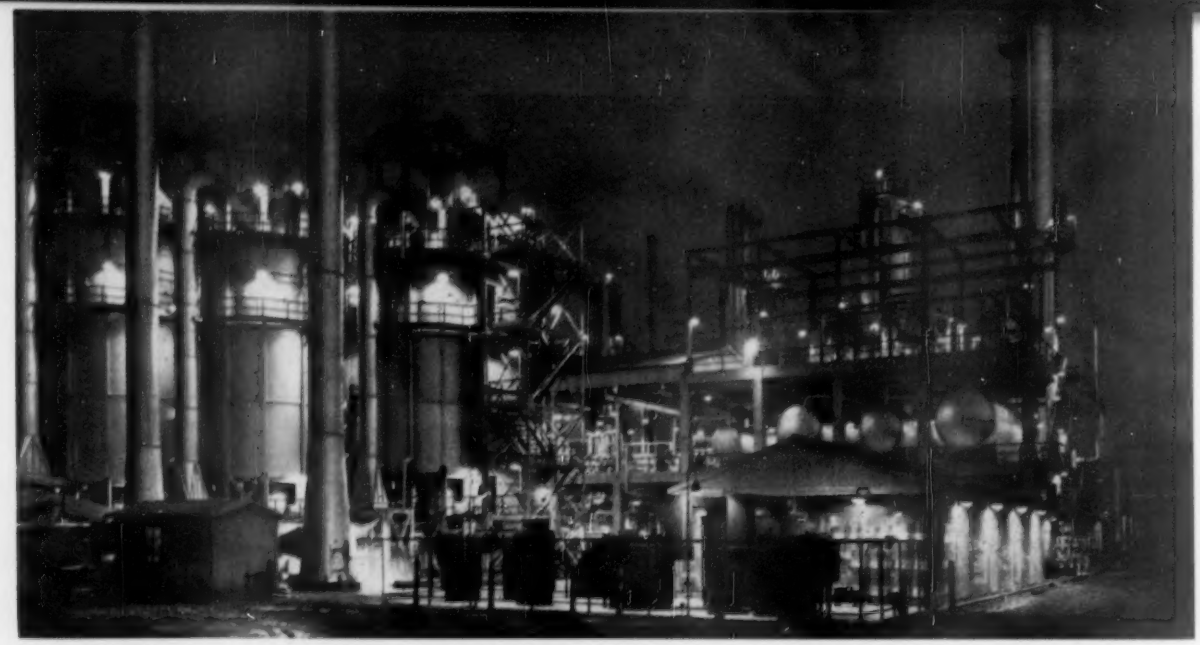
The only present Australian producer, in the western part of the continent, is controlled by Western Australian Petroleum Pty., Ltd. Lucky Strike Drilling Co. is now sinking a second well immediately south of the WAPET concession, Ogle said. The Susan Creek anticline, which underlies the Lucky Strike property, extends into the WAPET concession, Ogle added.

Drilling Up in Romania

The Romanian oil-well drilling office (Boldesti) has announced a 20 per cent increase in the rate of completions and a substantial pipe saving as the result of using a single string of casing in drilling operations.

Boldesti said the drilling-rate increase was recorded between January 1, 1954, and June 1, 1955. Ninety-five carloads of pipe were saved, the announcement stated.

Single casings were set in 88 per cent of the wells drilled last year and in 91 per cent the first quarter this year. Boldesti said it met its 1954 quota of completions by September 25. The drilling rate, as of June 1, was up 15 per cent over 1954. Communist countries never release actual figures on wells drilled or production.



HIGH-OCTANE catalytic reforming unit, using Sinclair-Baker new platinum catalyst, was placed on stream at Marcus Hook last fall. Unit converts 16,000 bbl. daily of low-octane stocks into top power fuel and into materials for petrochemical manufacture.

SINCLAIR-BAKER CATALYST

Cat Reforming With In-Place Regeneration

. . . at Sinclair's Marcus Hook refinery

First use of the Sinclair-Baker RD-150 catalyst has been in the cat reformer at the Sinclair Marcus Hook refinery. Experience with the in-place regeneration of this new platinum catalyst is summarized here.

According to the authors:

- **Excellent reforming characteristics coupled with the regenerability of the RD-150 catalyst offers the refiner the advantage of a flexible and economic reforming process.**
- **With need for higher gasoline yield-octanes in the future, the ability to regenerate the catalyst quickly and easily allows the maintenance of near-virgin activities throughout the life of the catalyst charge.**
- **It is therefore possible to select exact processing conditions for a given naphtha in order to secure the optimum economic operation at all times.**

by W. H. Decker and David Stewart

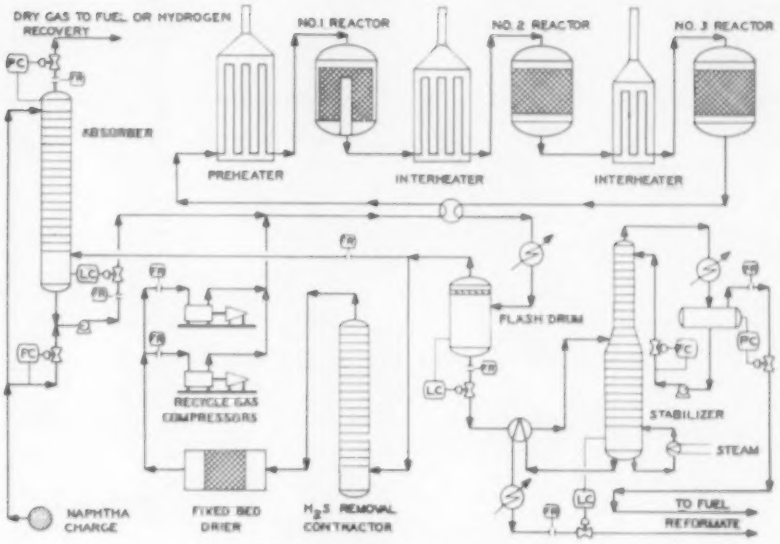
DURING recent years there has been a continual increase in the octane levels of motor gasoline. Based upon the national average of all producers in 1950 the average research octanes for the regular and premium grade were approximately 83.0 and 89.5 respectively, and in 1954, 85.7 and 93.0 respectively. It has been predicted that by 1960 the premium octane requirement will be 100 with a corresponding rise in the regular-grade octane. This situation, coupled with both the increasing compression ratio and vehicle registrations, forces the refiner to increase the gasoline barrel-octane yields.

Recognizing several years ago that the existing reforming processes would be unable to meet these requirements, Sinclair Research Laboratories, Inc., and Baker & Co. jointly developed a new platinum catalyst to be used as the basis for an improved reforming process. This process was first announced at the May 1953 meeting of the Division of Refining of the A.P.I.[1,2] Concurrently with this announcement, design and construction of a 16,000-bbl. per day reformer unit employing this new RD-150 catalyst was begun at the Marcus Hook refinery of Sinclair Refining Co. This was the first phase of a program for the installation of catalytic reforming facilities in the major Sinclair refineries. Since that time a total of 62,000 bbl. per day of reforming capacity, utilizing this catalyst, has been placed in operation or is under construction in Sinclair refineries. Other major refiners are planning or have in operation reforming units using this catalyst.

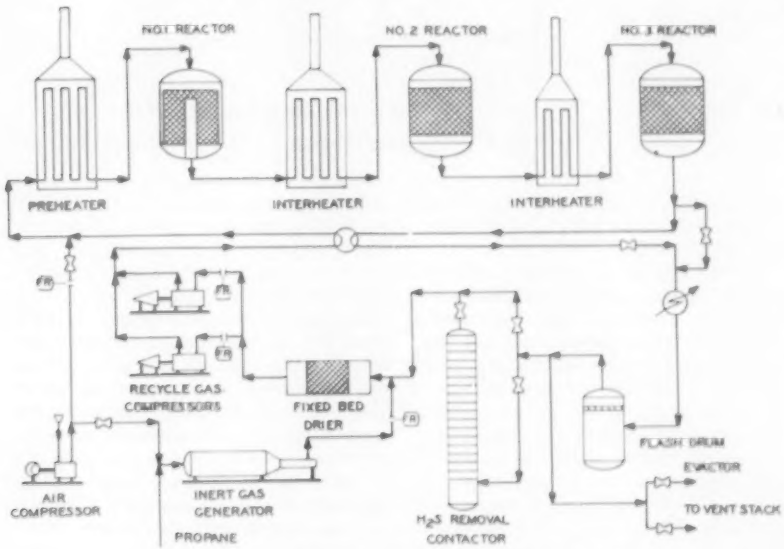
Advantages . . . This new catalyst, RD-150, embodies a number of specific advantages, among them being:

1. Selective naphthene isomerization and dehydrogenation.
2. High paraffin cyclization activity.
3. Low hydrocracking activity.
4. Ability to be regenerated, in situ, so that high activities may be maintained during the life of the catalyst.
5. Excellent resistance to permanent poisoning effects of sulfur, metals, or water in the virgin naphthas.

The resultant combination of these properties produces a superior catalyst that will increase yield octanes for all types of naphtha reforming operations.[4]



FLOW SHEET of oil processing system. Fig. 1.



FLOW SHEET of regeneration processing system. Fig. 2.

The ability to be regenerated quickly and easily guarantees long catalyst life, in terms of reformate produced per pound of catalyst, and it provides insurance against accidental loss in activity resulting from operational upsets.

Processing Description

The catalytic reforming unit at the Marcus Hook refinery employs three fixed bed adiabatic reactors designed to reduce adverse thermal effects. Basic process flow for this unit is illustrated in Fig. 1. The straightrun gasoline is first prefractionated (using equipment not shown) to a heart-cut fraction with a boiling range of approximately 215°-350° (A.S.T.M.). This naphtha is then fed as a lean oil to an absorber for recovery of butanes and heavier fractions from the net unit release gas, with part of this naphtha stream bypassing the absorber column for control purposes.

Cat reforming . . . From the absorber the naphtha is combined with the hydrogen-rich recycle gas stream and exchanged against the reactor effluent before entering the preheating furnace. The vapors from the preheating furnace flow in series through three reactors and two interheaters. Interheating between reactors is required to maintain reaction temperatures as the predominating reforming reactions are endothermic. During the oil processing cycle, for the same reformate octane level, the reactor temperatures are slowly increased to compensate for the gradual reduction of activity caused by coke deposition on the catalyst.

The effluent from the third reactor is exchanged against the incoming reactor feed, cooled to atmospheric temperature, and passed into a high-pressure flash drum. Here the reactor product is split into two streams. The hydrogen-rich release gas is compressed and recycled to the inlet naphtha system with the net gas make released through the feed absorber to the fuel system. Current plans involve utilization of the valuable hydrogen-rich gas for other processes. The liquid product from the flash drum flows to a column where the reformer is stabilized to the desired vapor pressure. Rerunning of the reformate is not required since no heavy polymer is produced by the catalyst.

For normal virgin naphtha concentrations, the RD-150 catalyst is resistant to poisoning from sulfur, metals, or water, and therefore treatment for removal of these materials is not usually required. However, because of the uncertainty of future foreign crude sources at the refinery, recycle-gas treating equipment was provided for this unit. This equipment consists of a glycol-amine treating unit for hydrogen sulfide removal and a fixed-bed alumina drier for removal of water absorbed from the glycol-amine contactor.

Low-carbon steels . . . This unit uses only conventional equipment with the use of alloy steels limited to equipment in high-temperature hydrogen service. The reactor vessels are made from low-carbon steels and are lined internally

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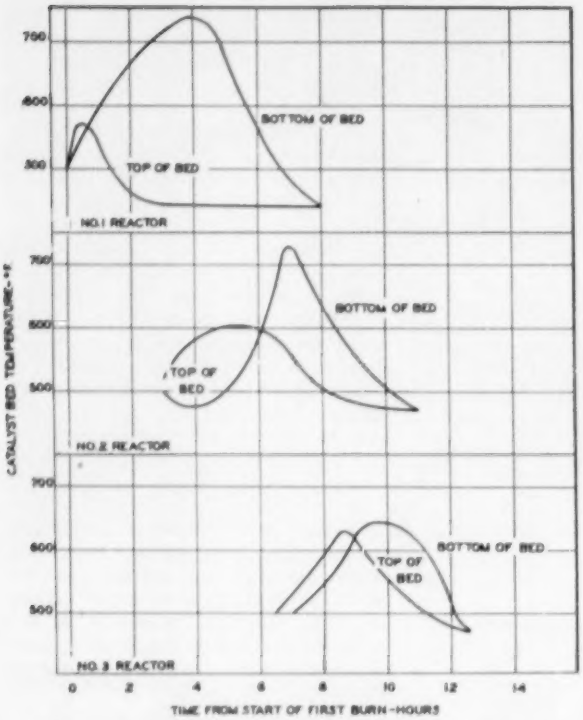
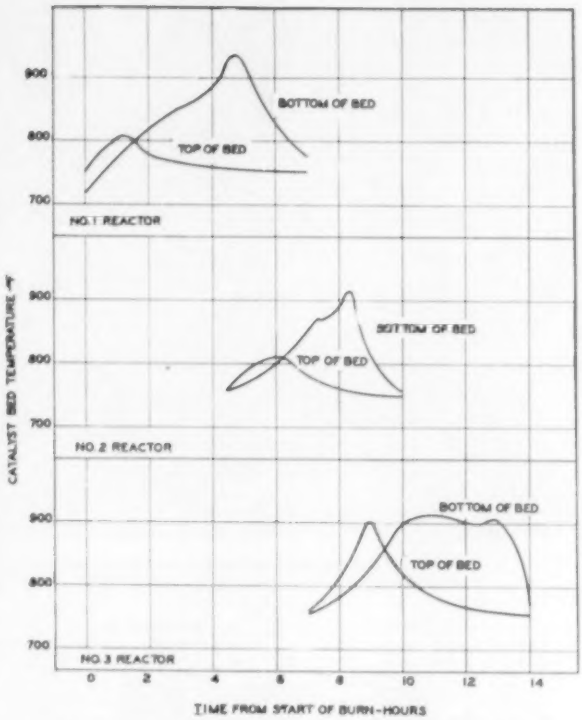
was in the technical department of Sinclair Refining Co. working on plant operation, equipment design, and combustion engineering. He has been with Sinclair Research Laboratories, Inc., from 1952 to date doing research in catalytic reforming and being concerned with design and operation of commercial reforming.

David Stewart graduated from Drexel Institute with a degree in chemical engineering in 1933 at which time he joined Sinclair. He has held various positions in laboratory and operations becoming chief technician at Sinclair's Marcus Hook refinery in 1952 which is his present position.



CATALYST BED temperature profiles for first burn. Fig. 3.



CATALYST-BED temperature profiles for second burn. Fig. 4.

with an insulating refractory so as to maintain shell temperatures below the level at which hydrogen attack might occur.

First Cycle Operation

The unit was first placed in operation in October 1954 using the following startup procedure. After thorough purging with inert gas and propane to remove air from the system, the unit was first evacuated to 100 mm. absolute and then pressured with propane to atmospheric pressure. Purchased hydrogen was then added to raise the system pressure sufficiently so that gas circulation could be started with the recycle gas compressors. The heaters were then fired and the reactor temperatures raised to approximately 850° F. at which time naphtha flow was started and the system pressure was then allowed to increase to 500 psig.

The feed rate was raised to about 11,000 bbl. per day and the operations were adjusted for the production of a C_5-end-point reformate research clear octane of 85.0. However, as the cycle continued this was raised to the 87-88 range because of increased motor-gasoline octane levels. For this first processing period, lasting about 4 months, the feed rate averaged 11,400 bbl. per day. This less-than-design feed rate was due to the necessity for obtaining maximum heating-oil production with a consequent reduction in the quantity of naphtha available for reforming. Typical feed-stock inspections and yield data for this period are presented in Tables 1 and 2.

The first cycle operations have been uneventful with only several short-duration upsets caused by minor mechanical difficulties. During this cycle, however, it was found that there was a gradual increase in the pressure drop across the No. 1 reactor bed. While this pressure drop was not limiting to operations it appeared advisable to shut down for an inspection of the unit prior to the start of summer gasoline season. Other than the need for this inspection there was no operating reason for taking the unit out of service. The catalyst had undergone no appreciable activity reduction during this period as evidenced by only minor increases in the required reactor temperatures, with part of these increases due to the higher reformate octane levels. At the time of the shutdown the catalyst had processed 15.0 bbl. of feed per pound of catalyst.

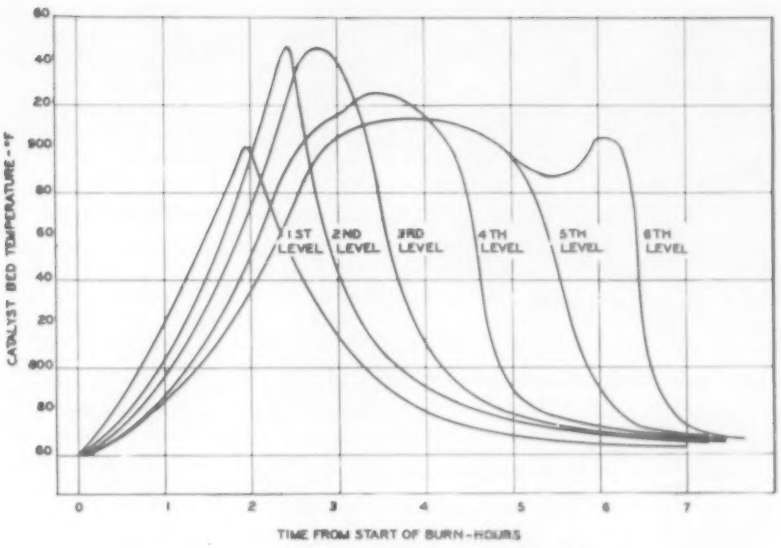
Regeneration

The regeneration of the catalyst is a comparatively simple procedure involving the removal, by combustion, of the coke deposits that accumulate on the catalyst. Before regeneration the catalyst contains about 6.0 weight per cent carbon while the regenerated catalyst contains less than 0.2 weight per cent carbon.

Cycle length . . . As the naphtha processing cycle continues there is a gradual increase in the coke content of the catalyst. This impairs the activity and thus requires progressively higher reactor inlet temperatures to maintain activity. The processing cycle length is thus fixed by the reactor temperatures required to maintain the desired reformate octane without an adverse yield structure. Excessively high temperatures (950°-975° F.) accelerate the undesirable (poor yield) thermal and catalytic reactions. Thus the cycle length will be determined by (1) the quality of the naphtha charge stock, i.e., highly paraffinic stocks require more severity than highly naphthenic stocks for the same reformate octane, and by (2) the reformate octane level, i.e., the higher the reformate octane the shorter the cycle length for a given naphtha feed.

"Heat-balance operation" . . . The actual regeneration consists of admitting controlled amounts of air to the catalyst beds under controlled temperature conditions. The rate of combustion is therefore dependent upon the amount of coke present, the system temperature level, the rate of air addition, and the rate of heat removal from the catalyst bed (inert gas recycle rate). Since this is essentially a "heat balance" operation, the burning can be controlled as desired by suitable adjustments of these variables.

Regeneration was carried out in three stages as follows:



TYPICAL burning wave pattern for second burn. Fig. 5.

1. A low-temperature burn (preburn) at 500° F.
2. A second (main) burn at 750° F.
3. A final burn between 920°-940° F.

Regeneration equipment . . . The process flow and the equipment required for regeneration are illustrated in Fig. 2. The equipment specifically required for regeneration includes a pressure type inert gas generator and an air compressor, with the air compressor serving as a dual-purpose unit in that it furnishes air for coke burning and combustion air for the inert-gas generator. It may be noted that if a supply of high-pressure air is available and if bulk nitrogen is readily procurable, the resultant economics may preclude the installation of this equipment, because of the infrequency of the regeneration operation.

Preburn . . . The procedure used for this regeneration was as follows: The naphtha feed to the unit was stopped and the heater fires shut down, with the gas circulation continued until the reactor beds had cooled to approximately 500° F. The recycle-gas compressors were then taken out of service, the unit depressured and evacuated for hydrocarbon gas and hydrogen removal. The inert-gas generator was placed in operation, the system thoroughly purged, given one final evacuation, and then pressured to approximately 30 psig. with inert gas. Circulation was then started with the recycle-gas compressors, the heaters were fired to maintain approximately a 500° F. inlet reactor temperature, and the unit was then ready for the low-temperature (first) burn.

Bed temperatures . . . The air required for the burning was adjusted at a concentration of between 0.5 and 0.7 mole per cent of oxygen, with this concentration based upon previous studies which indicated that at the operating inert gas recycle flow the temperature rise would be in the order of 170°-200° F. The movement of the burning wave through the three reactors is illustrated in Fig. 3, which is a plot of the top and bottom catalyst-bed temperatures for the three reactors versus time.

It will be seen from this plot that the burning wave moves progressively through the three beds with the second and third beds undergoing temperature rises before the completion of the burning in the preceding bed. This is primarily the result of the passage of the heat wave. However, it is also influenced by the breakthrough of oxygen because of a nonlinear burning wave characteristic of this type of operation.

The shape of the burning wave and its progress through the bed is controlled by the rate of air addition, the inert-gas recycle flow rate, and the temperature; consequently, with fixed conditions the wave should be substantially similar in all portions of the bed. Other variables affecting the shape and rate of passage of the burning wave are, however, the amount and composition of the coke deposit in that portion of the bed under consideration.

It will be noted that the top bed temperature in the No. 1 reactor fell off quite rapidly which would apparently be indicative of an abnormal condition in this bed. This was later found to be the result of partial plugging at the top of this bed.

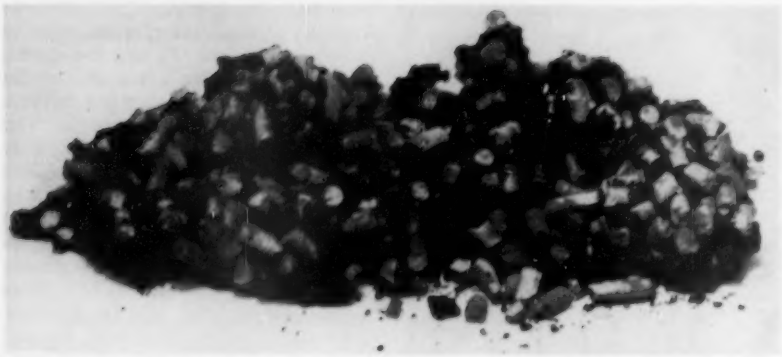
Main burn . . . At the completion of the low-temperature burn, the inlet temperatures of the reactors were raised to approximately 750° F. and the second burn started under substantially the same conditions of inert-gas recycle flow and oxygen concentration. The configuration and rate of passage of this higher temperature burning wave for the three reactors are illustrated in Fig. 4, which is a plot of the top and bottom catalyst bed temperatures against time. Again the same general phenomena are exhibited by this burning wave as was the case for the first or low-temperature burn with the exception of the higher over-all temperature level. Fig. 5 is a typical temperature profile plot of the second burning wave in the No. 3 reactor, and is based upon temperatures recorded from thermocouples spaced vertically at 1-ft. intervals through the 6-ft. catalyst bed. Differences in the peak temperatures and in the shapes of the profile curves at different levels are the result of variations in inert-gas recycle rates, inlet oxygen concentrations, and coke deposits.

Final burn . . . It will be seen from Figs. 4 and 5 that the pattern of the burning waves is not consistent for the three reactors, and also that all portions of the beds did not reach 900° F. at which temperature complete coke removal is assured. This latter item is particularly evident in the top portions of the No. 1 and No. 2 beds. It is therefore desirable to complete the regeneration by carrying out a final burn at high temperature.

This was accomplished by raising the reactor temperatures to between 920°-940° F., and maintaining this temperature until the oxygen content of the recycle gas has increased to 15-18 mole per cent by the addition of air from the regeneration air compressor. At the conclusion of this final burn the heater fires were shut off and the gas circulation continued until the unit was cooled to atmospheric pressure. The unit was then depressured and opened for inspection.

Short regeneration time . . . Aside from the time needed for the necessary depressuring and purging of the unit before and after the regeneration, the time for the actual regeneration was comparatively short, the first burn requiring 11 hours, and the second burn requiring 14 hours. A longer time period was involved for the second burn because of the more refractory coke that is removed at the higher temperatures.

It will also be seen from Fig. 4 that the third reactor contained the greatest amount of coke, which is consistent with the fact that it operates at the highest average temperature during the oil-processing cycle. For this regenera-



SAMPLE OF LAYER of plugged catalyst below upper catalyst-retention screen.

tion the average coke level was in the order of 6.0-7.0 weight per cent coke on the catalyst. However, for longer processing cycles under more severe processing conditions, i.e., higher octane levels, there would be a greater accumulation of coke which would in turn require a longer regeneration period.

System pressure . . . This was allowed to increase during the first burn from the initial pressure of 30 psig. to an operating pressure of approximately 100 psig., and during the regeneration this pressure was maintained by manual release of excess gas to the vent stack. Higher pressures would allow for greater rates of inert-gas circulation with consequent higher rates of air addition. However, this was fixed by the characteristics of the recycle gas compressor turbine drivers.

For the regeneration operation the H_2S removal contactor was blocked in and bypassed, while the fixed-bed drier was continued in service for removal of water produced from the combustion of the coke. The gas contactor was blocked in under recycle-gas pressure just prior to the end of the oil-processing cycle. This hydrogen-rich recycle gas is therefore available for the subsequent startup and this precludes the need for a special hydrogen storage drum or for the purchase of bulk hydrogen.

No. 1 reactor plugging . . . When the unit was opened for inspection it was found that there was a collection of scale, debris, etc., on the top of the No. 1 reactor bed. This partially plugged the retention screen on the top of the catalyst bed. Fig. 6 illustrates the foreign material which had passed through the screen and become imbedded in the top one-quarter layer of catalyst. Since it is difficult to insure a completely clean system, it was decided to modify the existing down flow design of the No. 1 reactor to an annular or radial design thus eliminating the possibility of pressure-drop difficulties during future operations. This design change involved a reduction in the net catalyst inventory in the No. 1 reactor and this will be reflected in slightly different operating conditions for the second and subsequent processing cycles.

TABLE 1—COMPARISON OF AVERAGE OPERATING CONDITIONS FOR THE FIRST AND SECOND PROCESSING CYCLES

	First cycle	Second cycle
Operating conditions:		
Feed rate, bbl. per day	11,400	11,290
Space velocity, w.h.s.v.	1.42	1.56
Pressure, psig.	500	500
Recycle ratio, moles gas/mole HC	8.1	8.0
Recycle ratio, moles H_2/mole HC	6.6	6.6
Reformate octane, research clear	85.5	88.2
Reactor temp., °F.:		
No. 1 inlet	924	928
No. 2 inlet	914	914
No. 3 inlet	888	898
No. 1 outlet	824	829
No. 2 outlet	877	879
No. 3 outlet	890	902
Feed stock inspections:		
Gravity, °A.P.I.	56.5	56.8
I.b.p., °F.	214	210
10 per cent, °F.	230	224
50 per cent, °F.	249	247
90 per cent, °F.	289	293
E.p., °F.	346	350
PONA analysis:		
P, vol. per cent	48.9	46.4
N, vol. per cent	37.3	39.9
A, vol. per cent	13.8	13.7
Octanes:		
Research method clear	51.3	52.6
Research method +3cc.	72.0	75.2

TABLE 2—COMPARISON OF TYPICAL YIELD DATA FOR THE FIRST AND SECOND OPERATING CYCLES

	First cycle	Second cycle
Yields:*		
H_2, wt. per cent	1.0	0.9
C_1, wt. per cent	1.3	1.2
C_2, wt. per cent	1.9	1.8
C_3, wt. per cent	2.4	2.2
IC_4, vol. per cent	1.6	1.5
nC_4, vol. per cent	3.3	3.2
C_5-e.p. gasoline, vol. per cent	91.5	92.0
10-lb. R.v.p. gasoline, vol. per cent	101.0	101.7
Octanes, 10-lb. R.v.p. gasoline:		
Motor method clear	80.2	80.2
Motor method +3cc. TEL	89.7	89.7
Research method clear	86.1	86.1
Research method +3cc. TEL	96.6	96.6

*Yields adjusted to the same base octane level for comparison purposes.

Second-Cycle Operations

At the conclusion of the shutdown period the unit was placed in operation making use of the previously described procedure, with the exception that stored recycle gas from the first-cycle operations was used instead of purchased bulk hydrogen. Currently the operations for this cycle are comparable to those of the first cycle except for the higher space velocity (1.56 against 1.42) and the higher reformate octane level, 88.2 against 85.5 research octane number.

Operating data . . . To illustrate the comparison of the first and second-cycle operations, operating conditions, feed-stock inspections, and yield data for these two periods are presented in Tables 1 and 2. The yields for these two periods have been adjusted to reflect processing operations at the same 10 lb. R.v.p. gasoline research clear octane because of the variations of the octane levels and feed-stock quality for these two periods. A review of these tabulations will indicate that after making allowance for differences in feed-stock quality, catalyst inventory, and reformate octane level it is evident that the regeneration operation was successful with no apparent deleterious effects to the catalyst. The activity level of the catalyst is substantially the same or slightly improved as indicated by the reactor temperatures for these two periods.

Acknowledgment

The authors wish to acknowledge the permission of Sinclair Refining Co., Sinclair Research Laboratories, Inc., and Baker & Co. for the publication of this information. Acknowledgment is also made to the large group of individuals in these organizations who contributed to the development and implementation of this improved reforming catalyst.

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What Does It Take to Achieve Safety in Drilling Operations?

1. Wise management policies that provide the tools required for safe operations and assure fair treatment of the man on the job.

2. Responsible supervision by the tool pusher at the rig to make sure that the safety regulations laid down by management are followed in actual drilling operations.

3. Safety consciousness among the crew members, and teamwork—the kind of teamwork that makes each man watch out for the other man's safety as carefully as he does for his own.

by Jack Auser

GOOD relations and safety in operations get their start or first big kickoff at top-management level. The big push comes down the line in the form of policies, manuals, programs, meetings, statistics, and specialists. If you don't get results, the push can become an ultimatum. No matter what methods are used, you are left with no doubt in your mind that all levels of management are actively and seriously behind the safety and welfare of the man on the job. They are willing to do all in their power to help you and your crew carry on a rather hazardous operation in a safe and accident-free manner. As long as management furnishes the tools, and follows a policy that is consistently fair to the man on the job, it has done its part. That is, other than to check, recheck, and double check to assure that policies are realistic and being carried out. This is where the tool pusher comes in.

The tool pusher has the contact between management and the man on the job. As such, he has a responsibility that is over and above getting the job done; the responsibility of assuring good crew relations and safety of operations.

Good crew relations and safety are not spectacular. They consist of many small incidents and actions in everyday working routine. The accident is far more spectacular, though not agreeably so, than the prevention.

The author is drilling foreman with Standard Oil Co. of California. Paper presented at the Western Oil and Gas Association drilling section safety conference, Pacific Coast Club, Long Beach, Calif.

Good crew relations . . . The crew that works hard to get the pump that went down on morning tour repaired before the daylight crew comes on; the gang that gets the dirty jobs, like cleaning out the cellar or shaker pit, done on their tour without pushing it along to the next crew all point to good relations. Good relations show even stronger when the crew coming on does the dirty work left by the other crew because they couldn't get to it. The usual well-placed kidding, or sometimes caustic remarks about taking care of your own work are healthy. The job gets done with safety and speed. It is when these caustic remarks are thought and not said that safety is apt to slip up. In this case the man left with the job to do has not accepted the group spirit of work. He has a chip on his shoulder and is accident prone.

Good housekeeping on the rig is a standard of good safety. The crew that takes pride in keeping the rig clean, tools and equipment in place, and unneeded subs or other material out of the way is a safe-minded crew. Good housekeeping becomes a tougher job while drilling a directed hole, where all the extra subs, reamers, and so on, have to be on hand, with no regular place to keep them. Even worse is drilling fast shallow holes using oil for circulation, where there is a minimum of time for cleaning up a real messy job. Good crew relations are established when all crews do their part in this routine and continuous job.

You as the pusher have the right to expect good housekeeping but you can help the crew relations by giving a little praise to the crew doing the most conscientious job, and giving a well-placed prod to the gang not keeping up their end. Fortunately most rotary men are not bashful. They have ways of bringing the poor housekeeping crew into line.

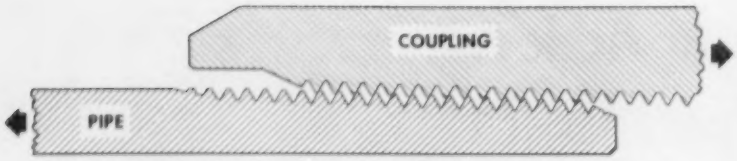
Safety conscious . . . You have all heard a lot about training the men to be "safety conscious." How about adding the "safety-conscious crew?" Rotary crews work as a tightly knit group. What one member does has a direct bearing on the whole gang. The crew has to be safety conscious of themselves, other crew members, the mechanic, and truck driver. A safety-conscious crew is one where each man watches out for the other man's safety as well as for his own. This crew will not leave booby traps for the relieving crew. You will agree that here is a definite tie between good relations and good safety.

Accidents . . . Although only one man may get hurt in an accident, the circumstances leading up to the accident often involve other crew members. Don't look at the man who cautions you about a hazard as a "back-seat driver." You should appreciate his concern for your safety, rather than resenting his remarks.

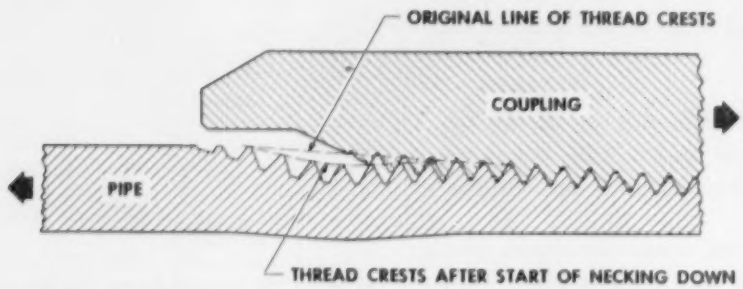
Training a new man . . . Every time a crew breaks in a "weevil" they practice good crew relations. They give him the full benefit of their knowledge and experience without complaint even though he doesn't pack his full share of the load for many days. The fact that they watch out for his safety and the extra hazard they are working under is proved by the relatively few accidents to men with less than a month on the rig. As long as he is a willing worker and a good guy, he will be taken into the crew and treated as one of the gang far quicker than he learns to be an all-around roughneck.

That good crew relations and safety are the consequence of many minor events and associations is evident. They consist of cooperation among management, foreman, crew, and individual. Without one we cannot have the other. Selfishly, the better the crew relations and their relations with you, the easier your job is. You can get away from the rig with confidence that the job will go along smoothly until you get back.

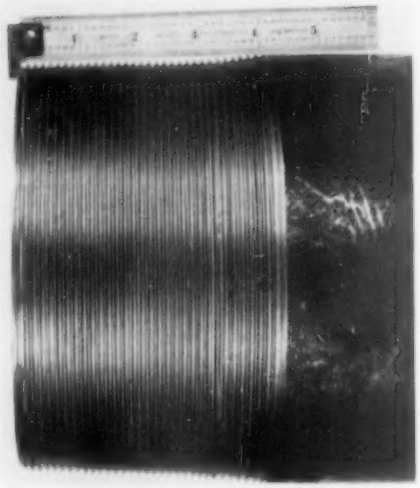
There is an old saying that the man over you can give you your job, but the men under you will keep it for you. Your honest effort to maintain good crew relations and safety for your men might make this saying true for you.



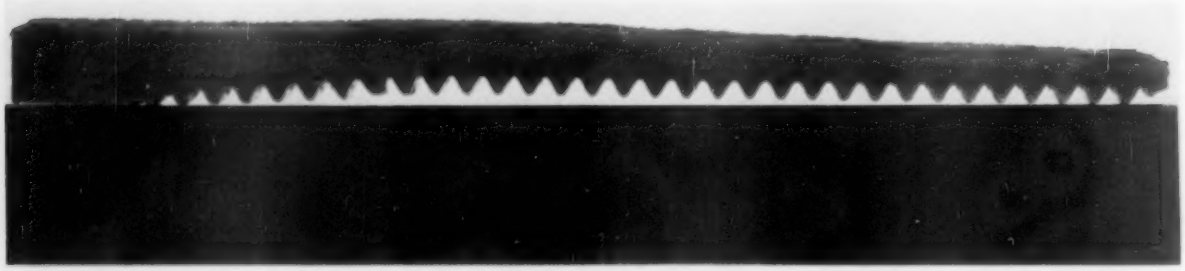
THIS IS HOW tension failure was originally thought to occur. Fig. 1.



THE MODERN CONCEPT is that tension failure is caused by "unzippering." Fig. 2.



THIS PIPE FAILED when the threads necked down under tension. Fig. 3.



HOW THREADS NECKED DOWN is shown in this cross-section of a pipe that failed under tension. Threads rest on a straight edge. Fig. 4.

1. Why Oil-Well Tubing and Casing Fail . . .

. . . in Tension, and Why They Collapse

by H. G. Texter

This article is the first of a series on casing and tubing troubles. These articles will give from the author's 30 years of experience everything possible about what causes the failures. Part 2, which will appear in an early issue, will include bursting, failure of the last engaged thread, leakage, and crushing. Part 3 will include wear, erosion, buckling, torsion, corrosion, and miscellaneous failures.

FIRST, let us consider the various things which make up **tension loading** of oil-well casing. (Design and selection of proper grades and weights of casing and tubing have been covered adequately elsewhere[1, 2]).

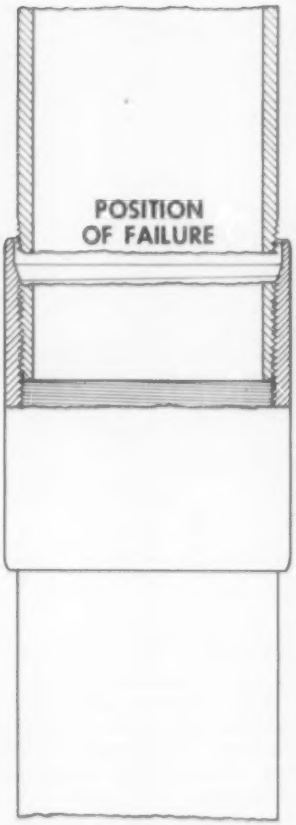
1. The weight of the casing itself, hanging onto a coupling (the top one for example). From this must be subtracted the buoyancy effect of the liquid in which the string is suspended. Calculations on tension loads ordinarily neglect buoyancy and assume that the string is hanging in air. This gives an additional, uncalculated safety factor.

2. Shock loads while running casing. Sometimes there is an unexpected, sudden slipping through a tight spot. This can build up, momentarily, an unwittingly high tension load.

3. Sometimes, in running casing, it may be logy due to a tight spot, as in a sloughing formation or where filter cake is being scraped off. To free such a string it may be worked up and down. The load for the upstrokes can be very high because of wall friction.

4. During cementing, casing strings are very often reciprocated vertically. This is to scrape off mud cake. It is of great importance, to insure good bond between pipe and the cement and the wall of the hole. As in (3), the tension involved in the upstrokes can be very high.

5. Temperature changes after the string is cemented. Circulating cold



RARE TYPE of tension failure is break at last engaged thread. Fig. 5.

TENSION FAILURE occurs in the body of the pipe when there is high joint efficiency. Fig. 6.

QUENCHING CRACKS in this section of pipe caused failure in tension after 2 months of service (magnified). Fig. 7.

mud might reduce the temperature of the casing; so would flowing a gas well with bottom-hole chokes. Cooling would increase the tension load at the rate of approximately 207 psi. per degree Fahrenheit drop in temperature[3]. Ordinarily, however, there is a temperature increase which would lower the tension load. In fact, the bottom section of the string may even be placed in compression and tend to buckle.

6. High fluid pressure inside a string of cemented casing will expand and shorten it and thus increase the tension load[4].

Design factors in tension . . . Many of the foregoing variables are unknown or incalculable. Therefore, casing strings are designed with a fairly high safety factor (more properly known as "design factor").* The one most universally used is 1.8, based on the minimum strength figure of the top joints and disregarding the buoyant effect of the mud.

* This is represented as the ratio between the minimum breaking strength of the casing, as obtained from the data books or specifications, and the calculated dead-weight load of the string. A design factor of 2, therefore, indicates that the load on the top length is one-half of the presumed strength of the material.

Several large companies drop this figure to 1.6, as a fixed policy. Many long strings have been run successfully with as low as a 1.5 factor. One company is going to 1.4 in certain areas.[5] Smaller companies, not being able to afford even one failure, usually use a design factor of at least 1.8 and even 2.0.

Mechanism of failure . . . Tension failure in A.P.I. threaded casing usually occurs as a "jumpout." It involves the necking down, or compressing, of the male (pipe) end, allowing it to jump out of the female (coupling) end. All of this occurs very suddenly, but not quite instantaneously.

The older theory was that all the mating threads tended to slide away from each other, all at the same time. Because of the radial component of the longitudinal tension force, the male threads were thought to become sufficiently reduced in size to slip past the tops of the female threads. This is illustrated in exaggerated form Fig. 1.

There is a fallacy in this theory of uniform slippage. If correct, it would mean that casing under tension should begin to show leakage as the loading increased because of the increasing separation between the mating surfaces. This, however, is far from true. Comprehensive tension-internal pressure experiments have proved this very conclusively. Up to the yield strength of the metal under the last engaged thread (which is very close to the failure point), there is no more tendency for a casing connection to leak at high tension loads than at zero load.

The present theory is that the failure is a sort of "unzippering" effect. The last engaged pipe thread slips inwardly (toward the pipe axis) from its mating coupling thread, thus throwing higher load on the succeeding pipe thread. It, then, also starts to slip. Additional load is then thrown on the third thread and so on. Soon, all of the threads have been permanently compressed into a smaller effective diameter and the coupling threads can pass over them. The joint then parts. The characteristic jumpout type of casing tension failure results.

All of this unzippering happens so very rapidly that the failure seems to take place instantaneously. In a tension-testing machine it occurs with a loud report.

This latter theory of casing-joint failure is shown in Fig. 2. It shows how this theory fits the facts, viz., that casing joints which are leaktight at no

tension load will not leak under tension until the tension load approaches the yielding load of the critical section.

Theory fits facts . . . If the second theory is the correct one, it is obvious that the joint strength of A.P.I. casing should approximate the yield strength of the metal under the last engaged thread. This is roughly correct. For example, the area under the last engaged thread for 5½-in.-o.d. 23-lb., N-80 is 5.414 sq. in. This times 80,000, the minimum yield for N-80, is 433,000 lb. This figure closely agrees with the published minimum joint-strength figure of 440,000 lb. for long-thread casing.

The older theory involves the coefficient of friction of the thread surfaces, variously lubricated. However, there is no correlation between attempted calculations and actual pulling-test figures.

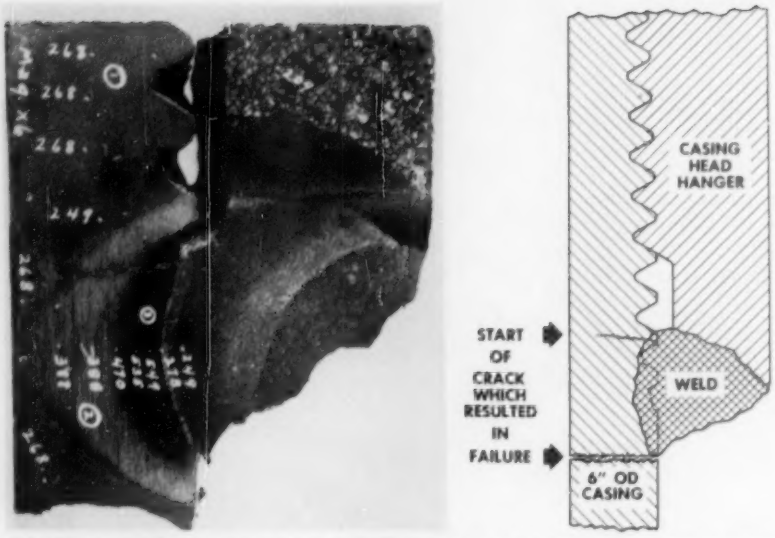
Regardless of the exact mechanism of failure, the result is a necked-down pipe thread (and occasionally an expanded coupling). To the casual observer, it looks undeformed. Lead, taper, and size readings, by gages, will quickly dispel this illusion. In fact, laying a steel scale longitudinally over the threads will clearly disclose the necking-down effect. (See Fig. 3.)

Note in Fig. 4 how the tops of some of the threads are turned over. The turn is in the direction of the scraping action as they slide from engagement with the coupling threads. This is very characteristic of a jumpout and is conclusive evidence of a normal casing-joint failure in tension.

Compression failure . . . The converse of a tension failure would be a compression failure. Again there would be a sudden "jumping" of the male threads with respect to the female. In this case the connection would not be parted.

Sometimes, in tension, A.P.I. jointed casing parts by breaking at the last engaged thread. (See Fig. 5.) This is particularly true of small-diameter heavy-wall pipe. It simply indicates that the ultimate strength of the metal under the last engaged thread was reached slightly before the jumping-out load was reached. It is a relatively rare form of casing tension failure. It was more common in the days of the old A.P.I. sharp-V thread and seldom occurs in the present round-V thread design.

High efficiency joints . . . With 100 per cent efficiency joints, where the joint strength is greater than that of the body of the pipe, a tension failure occurs, of course, in the body of the pipe, as illustrated in Fig. 6. The pipe has necked down and the wall was reduced, as in the case of any destructive tension failure of a tubular section.



IMPROPER FIELD WELD resulted in quenching cracks and failure of this section of casing. Figs. 8 and 9.

Joints of high efficiency may be made by upsetting the ends of A.P.I. casing or by work hardening or induction hardening the ends. Certain patented, square-thread, non-A.P.I. designs[6] approach or reach 100 per cent efficiency. These would fail by permanently stretching or parting in the body of the pipe.

Mill defects . . . There are very few mill defects conducive to tension failures. Poor longitudinal welds (in the case of welded casing), for example, would have no measurable effect on the tensile strength of a tube. Even exceptionally deep seams which might fail under very low internal pressure have no effect on tensile strength. The same would be true for very deep pits or other surface blemishes.

Poorly cut threads, although they might fail to make a fluid seal, are seldom bad enough to reduce joint strength. Insufficiently madeup connections, very little beyond handtight, show surprisingly high joint strength under pullout tests.

There is one mill defect, however, than can well be fatal, not only in tension but also in collapse or bursting. This is a locally hardened area. These areas develop from sticking and slipping in mill rolls or from accidental cooling by a water spray. The manufacturer always tries to discard such lengths, but occasional ones have been shipped, as described following.

A tension failure occurred in a Wyoming well where a water-quenched length of high-carbon casing had been run. The failure occurred about 2 months after the well had been put on production, some 1,300 ft. from the top, in the body of the pipe. It was recovered and examination showed a network of fine quenching cracks around the failure point. Hardness readings confirmed the origin of the cracks. Fig. 7 shows the appearance of this type of defect (magnified).

As a precaution against locally hardened areas, the user can and should have his casing internally tested to a high pressure. This can be done either at the mill or on the racks. The A.P.I. has now set up new, mandatory (for N-80) and alternative hydrostatic test pressures for casing and tubing. The tests are based on 80 per cent of the specified minimum yield strengths of the various items.[7] At these high pressures, especially if the lengths are pounded with a hammer or rattled with an air hammer while under test, any accidentally cold-worked or water-quenched areas will fail.

Failure from field welding . . . Figs. 8

THE AUTHOR

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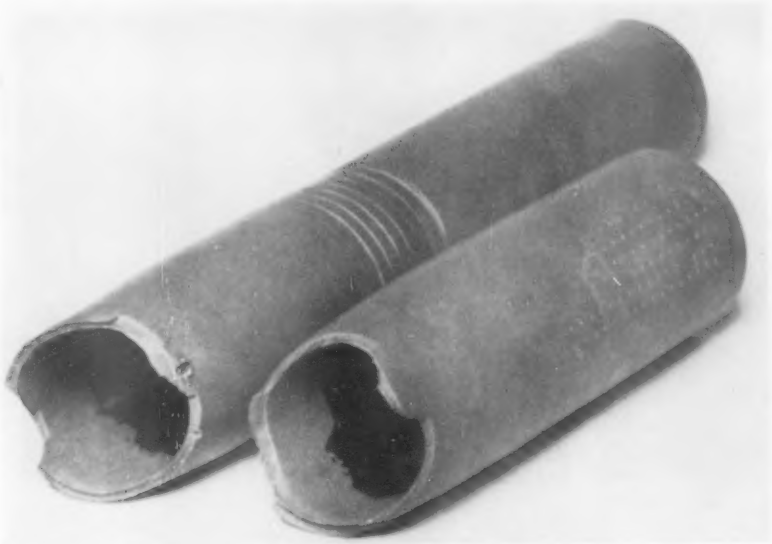


THIS TUBING PARTED while being pulled up to unseat a stinger from the packer. Necking down is example of tension failure. Fig. 10.

and 9 show a type of tension failure resulting from quenching cracks because of a very improper welding practice. A 7,500-ft. string of 6-in.-o.d., 17-lb., N-80 non-A.P.I. casing had been screwed into the hanger of a casing head. A heavy bead of weld had been run around the bottom of the hanger to give a positive seal against leakage between it and the casing. Therein was the error. The analysis of N-80 casing ordinarily is such that it is practically impossible to weld without dangerous embrittlement. So, a little over an hour after welding, while circulating for cementing, the casing suddenly parted right at the weld, and dropped the string.

In the photograph the hanger metal is at the right, the pipe at the left, and the weld metal in between. This is all shown more clearly in the sketch. Firth hardness readings, approximately equivalent to Brinell, show the wide variation from the original pipe-metal hardness (about 268) to the very high hardness figure of 549 in the dark area. This is where the heated area had been most drastically quenched by the cooling effect of the adjacent cold pipe metal.

Note the quenching crack and the failure point at the bottom of the pipe section, at about the thread runout. No doubt there were a number of quenching cracks in various parts of the pipe section, but only one happened to show up in this particular photograph.

Now, the danger of embrittlement by welding is well understood. The practice has been abandoned entirely if there is going to be any tensile stress whatsoever on the resulting weld. Only pressure beads are ever run, and even these are not considered very good practice. Reliable seals are more safely made with packing.

Preventing tension failure . . . Selecting a proper design factor is, of course, the first step in avoiding tension failures of casing.

Care in stabbing and making up the threaded connections should be taken, but this is primarily to prevent leakage. Only gross mishandling, such as very bad galling of the threads, could result in tension failures.

As stated in the fourth edition of A.P.I. R.P. 5C1: "Casing strings should be picked up and lowered carefully, and care exercised in setting slips to avoid shock loads."[8] Also, if the running of a string of casing is ever interrupted, to make machinery repairs for example, the string should be "worked" up and down or mud should be circulated, or both, to prevent sticking. Otherwise the string may stick to such an extent that it could be parted upon running.

Another precaution against tension failures while running casing, is the use of slip-type elevators instead of the "collar type" which pick up on the bearing face of the coupling. The danger is not because of any inherent fault in the collar-type elevator. It is because of possible wear of the lifting face or because of a defective (sharp) bearing face of the coupling. These things allow the load to rest unevenly on the elevator lifting shoulder. This tends to cock the coupling out of alignment and can easily flip it off and drop the string.

Incidentally, a broken elevator bail has been known to result in this flipping off of a coupling. Such an accident would not result in a dropped string with a slip-type elevator.

For these reasons the A.P.I. recommends that only slip-type elevators be used in running long or important strings of casing.

Tension failures, as mentioned previously, could occur after cementing if there were some very unusual cooling effect. Allowance should be made for this, if likely to occur, when landing the string in the casing head. However, in the great majority of cases it is better to set the casing in full tension. If even a small amount of weight is slacked off, there is danger of placing some of the uncemented section in compression with danger of buckling.

Compression failures . . . Compression failures are very rare (or rarely reported). There was one clearly established case in 1926. A string of 5½-in.-o.d., 20-lb. seamless casing was set down on bottom so hard that a pipe end jumped several threads into the coupling. Later, when the string was being recovered, this connection parted at low tensile load. However, there was little evidence of the pipe being necked down. Therefore, the operator threatened suit against the manufacturer, claiming that he had not pulled beyond the weight of the string in coming out of the hole. In this respect, of course, he was right; but he did not know, or did not want to admit, that the string previously had been dropped.

Tension-Tubing

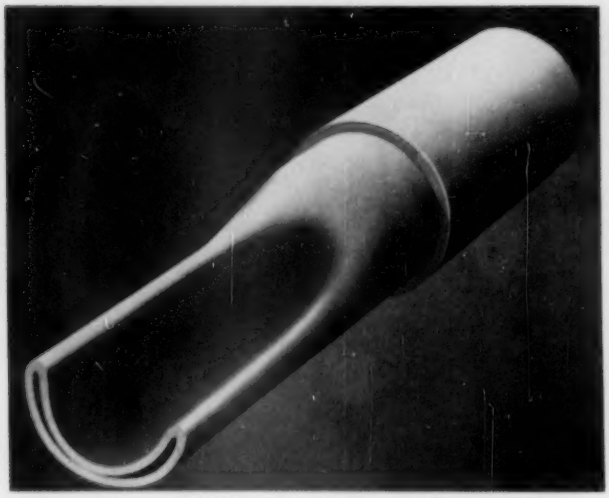
The mechanism of tubing tension failure parallels that of casing.

Since 90 per cent of all oil-well tubing is upset design, practically all failures are in the body of the pipe. However, any tension failures are rare because tubing is almost always run inside of casing. Except for occasional trouble of unseating packers, it seldom becomes stuck and, therefore, need not be pulled.

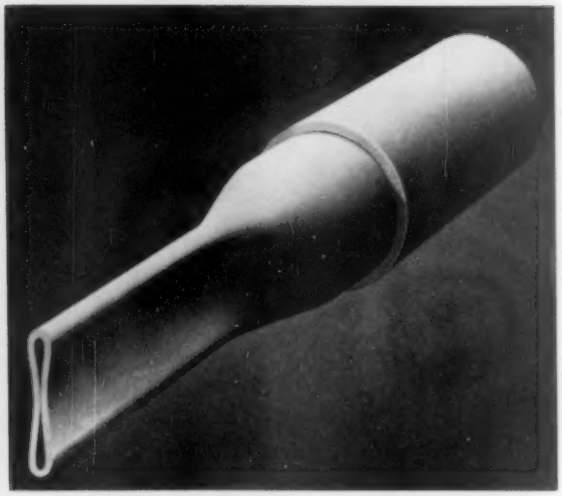
As with upset casing, upset tubing will stretch before failing. The writer once observed an operator pulling on a frozen string of 3½-in. tubing in an 8,200-ft. well. Three lengths were laid down before failure occurred. When the string was finally freed and laid down, the top 20 to 30 lengths actually tallied from an inch to a foot longer than when tallied into the well. Average elongation was 10 in. per length.

Fig. 10 is an ideal example of a pure tension failure in upset tubing. It was the top length of 12,600 ft. of 2⅜-in.-o.d., 4.70-lb., N-80 set in a South Louisiana well. While pulling up to unseat a "stinger" from the packer, this length parted.

The shorter section is the top of the



HYDROSTATIC COLLAPSE may form casing into a trough. Fig. 11.



OR, the casing may flatten to form a ribbon. Fig. 12.

failure and shows the slip marks of the spider used in setting the string. The other section shows overshot marks made in fishing for the lower part of the failure which had fallen back into the well.

Note the very normal necking down, evidenced by the thinned wall at the break. Note also how the internal plastic coating of the length had been cracked off by the extreme stretching before failure.

Nonupset tubing may fail by jumping out of its coupling, but it is more likely to fail by parting at the last engaged thread, as sometimes happens with casing. (See Fig. 5.) For both external-upset and nonupset, tension failures in tubing are so infrequent as to be practically negligible.

Preventing tension failure . . . In general, the same applies to the prevention of tension failures in tubing as applies to casing.

Use upset tubing except in very shallow areas. This is also necessary to avoid last-engaged-thread failures.

Select proper steel grade. With wells now producing from depths to 18,000 ft., it is becoming necessary to adopt a steel grade above N-80.

In lieu of higher grade there is the expedient of running combination strings of two diameters in which the upper portion is of greater wall section. Thus the upper part might be 2⅜-in.-o.d., 0.440-in. wall and the lower part 2⅜-in.-o.d., 0.190-in. (A.P.I.) wall. The i.d. of the 2⅞-in. is then the same as for the 2⅜-in. This particular combination has actually been run and is now being offered to the industry.

Casing Collapse

True hydrostatic collapse will flatten a length of casing practically wall to wall. The result is very often a trough, as in Fig. 11. It may also be in the form of ribbon, Fig. 12. As shown the flattening usually stops adjacent to the joint because of the reinforcing effect of the relatively heavy coupling or joint section.

Being an almost instantaneous sort of failure, the factors deciding whether the final form of a collapse will be a trough or a ribbon are unknown. Probably, certain conditions of unstable equilibrium are involved.

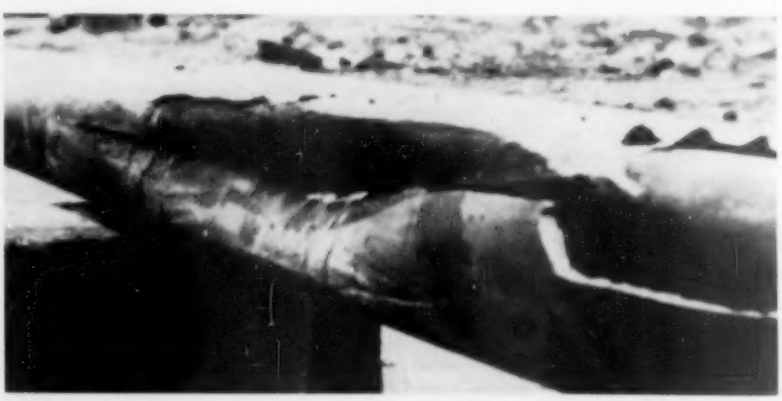
In a laboratory collapse chamber the pipe lengths under test are only partially collapsed. The system used in testing can develop very high pressure, but is very limited as to total energy. Therefore, after preliminary flattening deformation occurs, the pressure in the system drops to zero at once as there is no following-up volume to complete the flattening.

In a well there is enough energy. The fluid above the collapse point descends, and the walls of the pipe are brought completely together. This is what is meant by a true hydrostatic collapse. As it occurs most often in deep wells, it is very seldom recovered for study or for photographing.

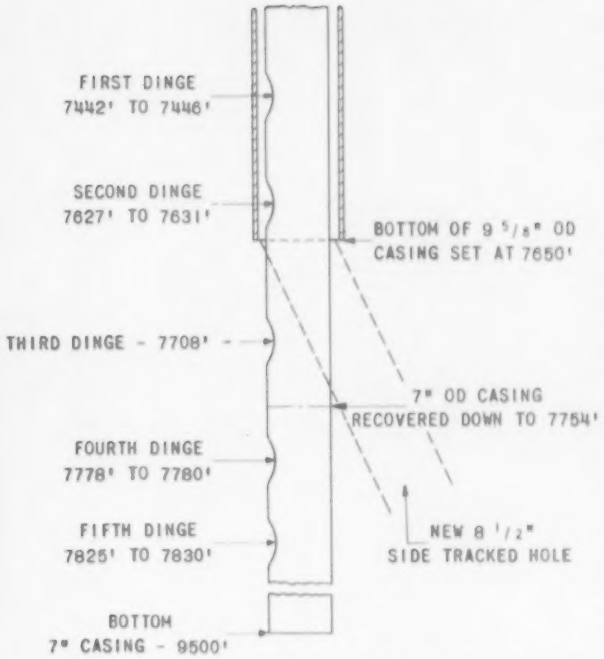
Nonhydrostatic collapse . . . Occasionally, collapse may be the result of diastrophic shifting of formations caused by an earthquake or faulting. Examples of the latter are reported in California in certain areas.

Recently, in North Dakota, there has been serious trouble in some 14 or more wells. The oil strings, 5½ or 7-in.-o.d., have been either partially collapsed or bent out of straight. Failure has occurred as soon as 3 months after the wells are completed. The trouble occurs in the thick Charles salt section which runs from 7,500 to 8,200 ft. in depth. (Production is found at 8,400 to 8,500 ft.)

Fig. 13 is a photograph of a section of 5½-in., 17-lb., J-55 casing recovered from one of the North Dakota wells by washing over and fishing. Both casing and tubing, which was inside, were re-



SALT FLOW CRUSHED this piece of casing. This failure is slow compared to hydrostatic collapse. Fig. 13.



MECHANICAL DEFORMATIONS, called dinges, sometimes occur during running of casing. Reamed-out dinge at left. Figs. 14 and 15.

covered together. Very evidently the casing is not collapsed wall to wall, as in the case of hydrostatic collapse. It can better be described as "crushed."

Among the theories proposed to explain those failures are these:

1. Large bodies of loose rocks from overhanging formations falling against the casing in large, washed-out cavities. This theory is not very plausible in view of the limited velocity which rocks may reach when falling in liquid and because of their limited mass.

2. Tectonic, glaciallike flow of the entire salt section, as in some California formations. This theory is still less plausible in view of the fact that North Dakota formations are nearly horizontal.

3. The most plausible explanation to date is that salt behaves plastically and flows, tending to close up the hole. If the annular space around the casing were completely filled with cement, then the salt could not flow. In this case, however, the plastic behavior of salt results in a progressive increase of pressure of the salt on the casing through the cement. The ultimate value of this pressure could be equal to the overburden pressure, i.e., approximately 1 psi. per foot of depth. This is about double the pressure against which the strings generally are designed for collapse. Therefore, long before the ultimate pressure is reached the casing starts deforming. The pressure is temporarily relieved. Only, after a certain period of time, the pressure builds up again and collapsing resumes. In other words, collapse due to salt flow is a slow process as opposed to collapse due to fluid pressure which almost instantaneously flattens the casing wall to wall.

This last hypothesis is well borne out by an interesting experience in one deep North Dakota wildcat. A string of 9⅝-in. casing had been set through the Charles salt where it was much deeper than usual: 8,704 to 8,779 ft. After some 43 days of drilling inside, a caliper survey showed there were five slightly constricted spots where the inside diameter was ½ to ¾ in. below the original inside diameter. These constrictions were rolled out, but some 44 days later at least one new constriction was found right at the location of the greatest original deformation. So it seemed that something was slowly pressing against the pipe.

The third theory suggests filling the annular space between the casing and the salt solidly with cement. Then, the portion of the string through salt should be designed strong enough to withstand the overburden pressure. But channeling makes it improbable that the annular space will be completely filled with cement if the hole is washed out. Therefore, more is needed in addition to using a stronger casing and making a careful, complete, cement job. It is also necessary to drill with fully salt-saturated mud to minimize washing out. These are indeed the practices which were recently adopted in drilling new holes.

Unfortunately, early wells in the Wiliston basin were not drilled this way through the salt sections, and the holes are washed out in a very irregular and asymmetrical way. In these wells the annular space is not entirely filled with cement. The slowly flowing salt does not contact the casing at the same time all the way around and all the way along its length. Therefore, in addition to collapsing, the casing is bent out of straight.

Mechanical collapse . . . There has been one case in which some foreign object seemed to have been rolled into five or more different lengths while a string of casing was being run. The well was 9,500 ft. deep and located near Beaumont, Tex.

The string was 7-in.-o.d., mostly 26-lb. The evidence clearly indicated that only partial (and therefore mechanical) collapse was involved. The deformed spots could be reamed out and a total of five were later recovered by pulling the upper part of the string.

Fig. 14 shows the third dinge, after it had been reamed out and recovered. One can visualize what it must have looked like originally, just an ordinary dinge. Fig. 15 is a diagrammatic view of the five dinges that were recovered. No telling how many more there might have been as the hole was sidetracked after recovering the fifth partial collapse.

As a hint as to what might have caused this dingeing, consider the following excerpt from a field man's report: "The casing was set hand-operated slips. As about the hundredth joint was being run, one of the slips was caught by the casing and dragged part way through the table, putting quite a large dinge in the casing."

Squeeze-job collapse . . . The pressure causing most casing collapse failures is simply that of the hydrostatic head of the surrounding fluid. Either the design factor was too low, the wrong weight or grade of casing was used, or the pipe was defective. However, another cause of casing collapse is incorrectly carrying out a cementing squeeze job. The tubing pressure used to force cement through the perforations will, to some extent, be applied on the outside of the casing, above the packer. This can and often has caused collapse. (See Fig. 16.)

An obvious remedy is to apply some back pressure in the annulus between the tubing (or drill pipe) and the casing. The step is often taken and should always be considered if the squeeze pressures are to be high. However, in cases of pressures upwards of 5,000 psi., the upper part of the casing string may not be strong enough. Fortunately, there remains the expedient of setting the packer a hundred or so feet above the perforations. This dissipates some of the squeeze pressure in the surrounding formations. It works successfully, but has the slight disadvantage of leaving more cement in the casing to drill out.

Effect of dinges . . . The most harmful accident that can happen to a piece of casing is a dinge. Just as a tall, slender column can support a heavy weight so long as it is perfectly straight, a tube can withstand heavy external pressure so long as it is perfectly round. Deform either one but slightly and its ability to resist failure goes down tremendously.

Theoretical calculations can show that a perfectly round, thin-wall tube, if deformed but 1 per cent out-of-round, will have its resistance to collapse lowered 25 per cent. This proves the importance of handling casing so as never to dinge it.

Crushing by slips or tongs is a deformation accident which may easily lead to true collapse. Unfortunately, even if the failed tube ever is recovered it would be very difficult, or impossible, to determine that crushing by tongs or slips was to blame. The tong or slip die marks might or might not furnish a clue.

Biaxial stress effects . . . A very important factor affecting the resistance to collapse of casing is longitudinal tension and longitudinal compression. Tension reduces collapse strength; compression increases it. This is the phenomenon of biaxial stress. It can be calculated mathematically and has been demonstrated by many tests.

The effect of tension on collapse resistance (biaxial stresses) is taken into account in combination casing strings. Heavier sections, or sections of higher A.P.I. grade, are run in the lower parts of casing strings for better collapse strength. These lower sections add tension to the upper sections, decrease their collapse strength. This must be considered in calculating design factors.

Several years ago four strings of casing, all in one area, very evidently had collapsed. The size was 6⅝-in. in combination strings of several weights and grades. On account of material shortage, design factors in collapse had been kept to a minimum. To illustrate, Well B is tabulated herewith:

			—Design factors—	
			Tension*	Collapse†
Top:	1,098 ft.	6⅝-in. 24-lb. J-55 A.P.I.	1.7	4.70
	3,489 ft.	6⅝-in. 20-lb. J-55 A.P.I.	1.6	.90
	2,603 ft.	6⅝-in. 24-lb. J-55 A.P.I.	3.5	.90
Bottom:	1,226 ft.	6⅝-in. 24-lb. N-80 A.P.I.	12.7	1.04
	8,416 ft.	Total depth of string.		

*Based on short threads and couplings. †Based on actual weight of mud: 12.2 lb. per gal. and corrected for effect of tension.

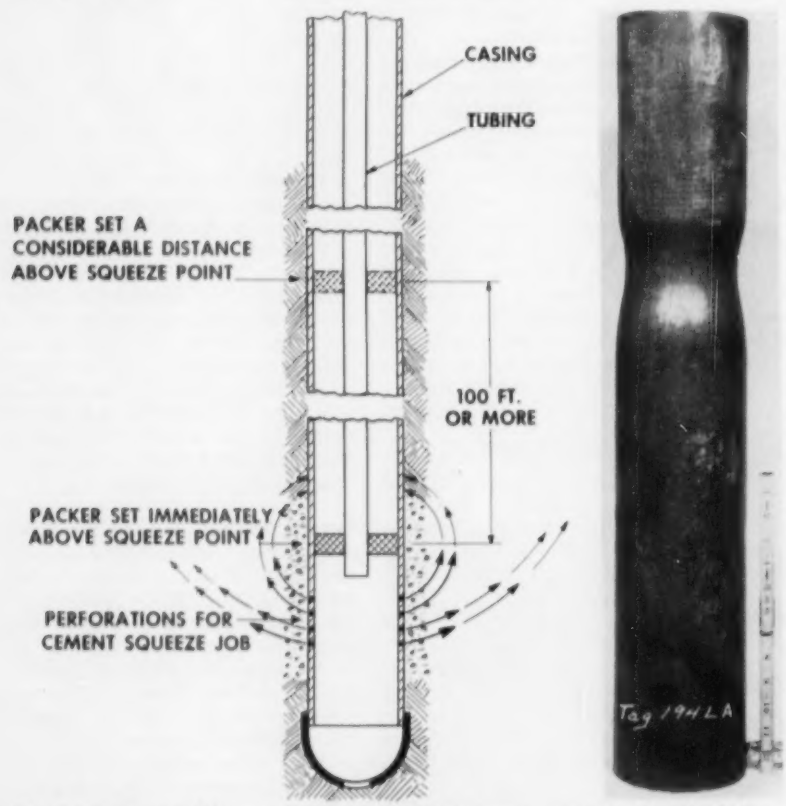
In each of the four wells, of which this one is representative, the failures occurred while swabbing. In each case the well had been swabbed below the failure point. In the case illustrated, the pipe collapsed at 4,550 ft. after having been swabbed down to 5,250 ft. Therefore, the failure occurred at the bottom of the 20-lb. J-55 section.

A.P.I. 6⅝-in., 20-lb., J-55 has a listed minimum collapse strength of 3,060 psi. The tension load of the 24-lb. J-55 and the 24-lb. N-80 sections, hanging below it, reduces the collapse strength to 2,600 psi.

At the depth where collapse occurred, in 12.2-lb. mud, the external pressure would be 4,550 × 0.634 (lb. per ft. of height) = 2,885 psi. Therefore, the design factor at the collapse point was only 0.9. Similar conditions existed in each of the other three wells. For each well it had been reported, "Casing cemented in full tension, then slacked off 'a little,' to hang in head." Thus the strings probably were in full tension to all intents and purposes.

Another failure . . . Fig. 17 shows an interesting casing failure involving biaxial stresses. The peculiar necking down occurred in a length of 5½-in.-o.d., 14-lb., H-40 A.P.I. casing near the top of a 7,800-ft. well in California.

The joint strength being inadequate (design factor of only 1.1), there had been a jumpout tension failure while working the string for cementing. To recomplete the string, a well-known type of packing casing bowl was lowered over the top length at the jump-


CASING
TUBING
PACKER SET A CONSIDERABLE DISTANCE ABOVE SQUEEZE POINT
100 FT. OR MORE
PACKER SET IMMEDIATELY ABOVE SQUEEZE POINT
PERFORATIONS FOR CEMENT SQUEEZE JOB
Tag 1941 LA

COLLAPSE OF CASING can occur because of high pressures applied externally during a squeeze job, left, or because of external stresses applied mechanically by a packing casing bowl, right. Figs. 16 and 17.

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out point and some tension exerted. This sets slips which cause lead rings to pack tightly around the pipe to make a fluid seal.

After thus recompleting the string, it was found that tools would not pass the necked-down section. This was recovered. Obviously, a combination of tension and collapse forces had operated according to the well-known laws of biaxial stresses. The result is a perfect example of a tension-collapse failure. The collapsing force was applied by the lead rings, which, under compression, flowed and reacted exactly like a liquid.

Neither of the forces was very high. The tension must have been below the tensile strength of 5½-in., 14-lb., H-40 casing because no further parting occurred. Therefore, the longitudinal tension was something under 241,000 lb. (the average joint strength of the casing). But, the resultant of the two forces was enough to deform the pipe as a combined tension-collapse failure. Biaxial stress calculations will show that, at a tensile load of only 100,000 lb. the collapse resistance of 5½-in.-o.d., 14-lb. H-40 tubing is lowered to 1,600 psi. from its normal minimum collapse strength of 2,440 psi. Small wonder, then, that the lead rings could flow so tightly against the tube as to start the necking-down type of collapse illustrated. Once the collapse had started, tension alone could continue the deformation. (Ordinarily, the action would proceed to the parting point, but did not in this case.)

Buoyancy's effect . . . The effect of buoyancy on a casing string puts the bottom of the string in hydrostatic longitudinal compression. Since compression increases the resistance of casing to collapse, some say there is no need to consider the biaxial stress phenomenon.[11] With this, the author disagrees. The final tension condition of a cemented string of casing is usually unknown, mainly because of unpredictable temperature changes. It is better to have some additional, uncalculated safety factor.

We ordinarily disregard the effect of buoyancy in making tension design-factor calculations. It is just as logical to disregard its effect in figuring collapse design factors.

Design factor for collapse . . . With most operating companies the accepted design factor in collapse is 1.125. This is based on the published minimum collapse data, taking into account the effect of tension on collapse in combination strings. It also is based on the assumption that there is no fluid inside the casing and that the surrounding fluid has a hydrostatic head of 0.5 lb. per foot of height regardless of the actual weight of the mud.

A few companies work to higher design factors, such as 1.25 and 1.33. Some others drop to a factor of 1.0 (and even to 0.85[5] below the top of cement), but they usually take into account the actual hydrostatic pressure of the mud in the annulus.

There has been a trend to use of collapse design factors less than 1 for intermediate strings. This is on the theory that these larger-diameter strings, such as 9⅝ and 10¾-in., will never be bailed down. To the author this makes good sense, but the operator should be pretty sure that there will be no unexpected emptying of the string by a thief sand or for any other cause.

Preventing casing collapse . . . The principal step, of course, is to use the correct weight per foot and grade of casing for the conditions in the well, and apply the accepted design factor. The effect of tension on collapse must never be neglected.

Another factor must be considered in the relatively new method of drilling with gas. It is the cooling effect of expanding gas as it flows through the oil string. With cooling, and with the pipe immovable at both ends, there is an increase in tension and, therefore, a decrease in resistance to collapse.

Ordinarily it is not worth while to try to guard against collapse from mechanical causes such as faulting or earthquakes. The intensities of such phenomena are unknown. Usually they are so great that design factors of 5 or 10 or even greater still would not prevent failure. Even solid bars, for example, would be sheared off by a major formation slippage or faulting.

However, the problem has been attacked to some extent in California.[12]

One very worth-while precaution in the prevention of collapse failures would be to avoid dingeing of the casing in handling, either in trucking or pulling into the derrick. Fortunately, dinges can be seen readily and can be felt with the hand. Any length which might have been knocked out of round during transportation should be discarded. Passing an A.P.I. drift completely through each length before stabbing is well worth while in an important casing job.

Even after commercially round dinge-free casing has been stabbed it can be deformed by tonging. This is not very likely with heavy-wall casing, but it has happened and will, of course, reduce resistance to collapse. Poorly fitting or improperly designed tongs could cause dingeing. More often it is a result of over-tonging, especially with the non-A.P.I. shouldering types of joint, which arrives at a rather abrupt end point to its makeup.

Effect of wear on collapse . . . After casing is cemented, particularly the producing string, wear is undoubtedly a factor in collapse failures. The wear might be from drill pipe, especially where tungsten-carbide facing on the tool joints has rubbed against the inside of the casing. Even nonhardfaced tool joints will produce some wear effect.

Rubber protectors will effectively prevent wear of the casing. They must be adequate in size and properly placed on the drill pipe.

Where wells are drilled in with cable tools, wire-line cutting must surely be the direct cause of some collapse failures. Collapsed casing is so seldom recovered for investigation that we can only guess at the seriousness of wear. However, several cases are on record where wear from tool joints took place in surface casing which was recovered.

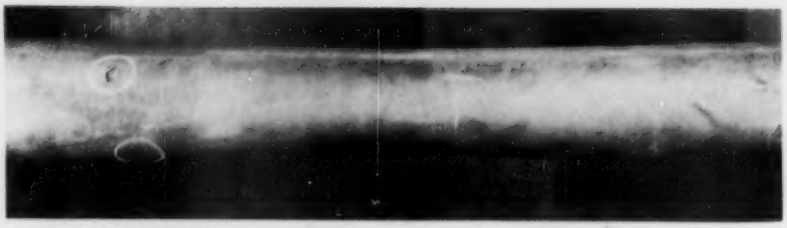
Effect of mill defects . . . Mill defects, of course, can result in low collapse values. However, as yet, there is no reasonably inexpensive method of checking collapse strength. Even spot-check by making one collapse test per 100 lengths or per carload would be too expensive and time consuming.

Without some satisfactory performance-value test in collapse, the next best thing is a high-pressure internal hydrostatic test. Admittedly, this is not testing the pipe in the right direction, so to speak. But experience has indicated that if a tube will withstand an internal pressure of 80 per cent of its calculated yield strength, it will also withstand an external pressure equal to or greater than its published collapse strength. The only possible exception to this would be the case of an out-of-round or dinged tube, which can be readily seen and discarded.

Some things which a pipe mill can do wrong in manufacturing have little effect on resistance to collapse. This is true whether it be made by the butt-weld, lap-weld, electric-weld, or seamless process. For example, a tube with a very poorly made butt weld might fail at a very low internal pressure. However, it obviously could show a perfectly normal collapse strength.

As another example, an eccentric walled seamless tube, far beyond the allowable, will almost invariably collapse above its minimum published strength figure. This is because eccentricity in seamless is spiral and the thin side is not in a straight line. As a result, the heavy side reinforces the thin side much more than might be imagined.

Very bad surface defects, such as deep pits and deep seams, well over the



MILL DEFECTS such as these pits do not initiate collapse of pipe. Fig. 18.

EVEN BAD SEAMS, shown here, have little effect on collapse strength. Fig. 19.

A.P.I. allowable (see Figs. 18 and 19) have no appreciable effect on collapse resistance. Obviously this is because their area is relatively small.

Out-of-roundness, like d i n g e i n g, greatly lowers the resistance of casing to collapse; but it, as in the case of dingeing, can easily be discovered. It would be evident in rolling the pipe on skids on in drifting. This ordinarily would be a transportation damage.

Tubing Collapse

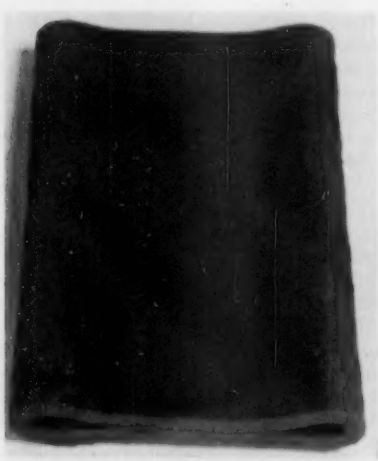
The factors in hydrostatic collapse of tubing are the same as those for casing. However, on account of the much higher wall-thickness-to-diameter ratio, tubing collapse failures are quite rare.

However, they occasionally do occur and a good example is Fig. 20. This was a 2⅜-in. o.d., 4.7-lb. J-55 tubing sub which collapsed in a well at a depth of 10,540 ft. From its published collapse strength of 7,180 psi., it should have withstood the hydrostatic head of 9.625 lb./gal. fluid at 14,360 ft., even though the tube had barely minimum properties.

The specimen showed normal analysis and proper wall thickness. Therefore, it must be assumed that either the tube had been dinged out of round or it was held in considerable tension as well as being empty down to the point of collapse. From the ellipse of biaxial stresses, the calculated tension load at the failure point would need to be only 34,300 lb. which is, of course, quite possible.

Another possibility is that the fluid (mud) weight might have been greater than the usually assumed gradient of ½ lb. per foot of height (9,625 lb. per gal.). Thus a 13.1-lb. per gallon mud would be enough to have caused collapse without any tension involved.

Part 2 will appear in an early issue. References for Parts 2 and 3 appear with this installment.



TUBING SOMETIMES FAILS by hydrostatic collapse as shown here. Fig. 20.

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Which Rig?

This . . .

. . . or This?

. . . Should you use on a given well. Here're some facts to consider

by Gene Graham

THE evaluation of drilling equipment with respect to a particular well must be accomplished prior to the starting of any well. Operator and contractor alike must select the "best" drilling for the job. "Best" means most economical, all things considered. Several factors must be evaluated in selecting one drilling rig from a group of rigs as the best for the job.

Type of well . . . To a contractor there are four types of wells to work on: wildcat, field-development, redrill, and deepening. A wildcat well, where little or nothing is known of subsurface conditions except for the geologist's calculated guess, requires a more competent rig than a routine development well where all conditions are understood.

A routine field-development well presents fewer problems since the drilling and completing operations generally follow an established pattern. A lesser drilling rig will usually suffice on a development well than on a wildcat well of the same total depth.

Location restrictions . . . Location restrictions certainly affect the selection of drilling equipment. In California oil fields all types of topographic conditions are encountered, from the flat jelly-like peat bogs of the Sacramento River area to the mountainous sections of Ventura County. Flat topography allows equipment to be spread out; this condition is one that exists in Mid-Continent areas and in some California areas. The layout of the rig certainly affects the cost of such activity. In particularly difficult mountain locations, the access road to a well may cost almost as much as the drilling.

Well program . . . The well program outlines the work to be done. It details hole size and depth, the size and length of casing strings, the mud requirements, etc. Depth here is the factor of primary importance since rigs are generally classified by depth capability. The incidental work such as coring, testing, swabbing and bailing are of secondary importance in rig evaluation. The evaluator must satisfy himself that the equipment will operate economically at the proposed depths.

Anticipated hole conditions . . . What will the drilling crews encounter as the well is drilled? Different conditions require different equipment. The bugaboo of loss of circulation makes mandatory tanks for storage of mud and a means of mixing large quantities of fluid quickly. The anticipated rate of penetration may be approximated in development wells, and this affects equipment evaluation. For example, a 7,500-ft. well in Dominguez field requires only 15 days and 18 bits where a well to the same depth at Bardsdale requires 45 days and 60 bits. It should follow that Dominguez drilling requires a lighter draw works and better pumping conditions than does Bardsdale.

Type of contract . . . There are two principal contracts under which wells are drilled—footage and day work. The basic difference between these is the assumption of risk; under a footage contract the contractor is paid a firm price and assumes all the risk of the hole, except for incidental day-work operations; under a day-work contract the oil company assumes the risk, and the contractor is paid on a per diem basis.

Machinery . . . Today's drilling rig consists basically of the following components: draw works; mud pumps; power for draw works and mud pumps; derrick or mast; mud-handling system; drilling string, including drill collars, and miscellaneous equipment.

● The draw works is used as a hoist or winch for two principal purposes: (1) to pull the drilling string from the hole and to lower it into the hole and (2) to lower strings of casing and tubing into the hole. It is called upon to perform these functions for from 25 to 45 per cent of the total time a rig is engaged on a well depending on the area in which the well is being drilled.

Draw works' ratings are generally based on their ability to hoist 4½-in. drill pipe at an economical rate. Some authorities have stated that the hoisting rate of 100 ft. per minute (off bottom) is a good criterion for evaluation. In the past several years, however, more attention has been given to the input horsepower rating of the draw works as a criterion. Users of modern draw works have found that manufacturers' ratings are conservative to a degree and that, since the draw works receives maximum input of power on an intermittent basis, it may be overloaded as much as 25 per cent.

● The importance of properly powered mud pumping equipment in appraising a drilling rig cannot be overemphasized. In the last few years much progress in hole making has resulted from an increased understanding of the use of the circulating fluid to increase rates of penetration. Before the advent of the jet bits, little emphasis was given to mud as an aid to the act of drilling. Mud, of course, has been used since rotary drilling began—to carry cuttings, to hold back subsurface pressures, to

Author is with Thomas P. Pike Drilling Co., Los Angeles. Article abridged from a paper presented at the spring meeting, Pacific Coast District, A.P.I. Division of Production, Los Angeles, under the title, "Factors in Evaluating a Drilling Rig."

cool and lubricate the drilling bit; but its use as a drilling factor has only recently been recognized.

Most drilling rigs today are equipped with two or more mud pumps. Generally the second pump is not so large and capable as the main pump; it is used on the hole only in emergencies and its principal use is as a means for mixing mud. Some rig owners, however, have successfully operated the main pump and the second pump in parallel with beneficial results. At times, particularly where the mud program is critical, a third pump, which is not to be used on the hole at all, is of great help as a mud mixer.

The evaluator must recognize the main pump's ability. He must know the rig setup as to paralleling or compounding two pumps on the hole. He must have a knowledge of the piping and manifolding systems used. When he understands all these factors he may place an evaluation on the equipment.

● There are two basic methods of applying the power from internal-combustion engines to draw works and pumps.

The first method uses the several engines as one package, and powers the draw works at one end of the compounding drive and the pumps at the other end. The evaluator must recognize the power requirements: (1) to hoist the drill pipe economically from total depth, which usually requires all the units working together and, (2) to power the mud pumps properly for maximum drilling results and, at the same time, apply sufficient power to the rotary table, through the draw works, to rotate the drilling string. He must allow a sufficient factor of safety, in the form of overload ability of the prime movers, to allow for one engine being down temporarily for repairs and to allow for pulling on stuck pipe.

The second method, where the draw-works power is independent from the pumps' power, usually requires more units of the same size as in the first method. Here total horsepower available is greater, yet it is questionable whether the added power will result in any more economical drilling.

● Derricks and masts are rated by "hook-load" capacity. It is probably true that, without exception, any given derrick or mast has a hook-load rating greater than the amount of strain that may safely be imposed upon other components of a rig. Other considerations, which are fully ignored at present, may be more important in the actual drilling of the well. For example, does the floor working area available offer freedom for the crewmen? Must the drilling string be laid down before casing is run just because the floor area is too crowded with the pipe standing in the derrick? It would appear that the prudent evaluator must know more than just the manufacturer's hook-load rating.

The so-called portable mast has been developed in a relatively short period of time to a position where operators and contractors today are using this type of equipment on 15,000-ft. wells. The time is probably not far distant when masts are available for 20,000-ft. holes.

● Mud and its treatment have become extremely important factors in drilling in recent years. All rig operators are aware of this, and they provide equipment in the form of shale shakers, settling ditches or tanks, suction tanks, mixing tanks, and testing equipment. These items are "standard" equipment, it is true; but, obviously some units are better designed than others. It is doubtful whether any contractor goes to such lengths as to describe his mud-handling and treating system in detail when he offers a rig, but it is certainly necessary to know what he has on his rig, and what is on the other available rigs, if the entire rig is to be evaluated properly.

● The drilling string is the life line of a drilling rig. As holes are drilled deeper, and particularly as directionally controlled holes become more prevalent, the importance of the physical properties of the drilling string increases. Related closely to the consideration of mud pumps and surface piping is the evaluation of the string as a pipe line to enable the pumps to deliver fluid in sufficient volume and at sufficient pressure where it is effective as a drilling aid—at the bit. Pressure loss in a drilling string is a great user of the power applied to the pump at the surface. It is true, for example, that the pressure drop in 5-in. o.d. drill pipe is approximately one-half as much as in 4½-in. o.d. drill pipe. The evaluator must coordinate his estimate of the drilling string's physical properties with his estimate of the mud circulating equipment to determine the effectiveness of the drilling string in this respect.

To maintain a downward force on the drilling bit, drill collars are used. These very thick-walled steel tubes transform the drilling string into a plumb bob, in effect. The usual rule for the application of weight to the drilling bit is to apply three quarters of the effective weight of the drill collars. This will maintain the drill pipe in tension, a condition deemed highly desirable to minimize abrasive wear which would result if the weight of the drill pipe itself were also applied to the bit.

Only one California operator has made drill-collar requirements a part of his bid request. When he is furnished the data he asks for, he can place an evaluation on this important part of a rig. It is difficult to conceive that a complete evaluation could be made by other operators without such information.

● Miscellaneous equipment, such as electricity generators, blowout-control equipment, pipe racks, dog houses, the overhead string, etc., are all necessary to complete a rig. All these items may be evaluated and placed in their proper perspective by an alert trained evaluator.

It may safely be said that no oil operator has ever included in his equipment specifications which, at times, accompany his invitations to bid, a request for a description of the overhead string—the crown block, the traveling block, connector, and swivel. Yet the success of his entire drilling venture literally hangs by this equipment. Surely it is as logical to assure that this equipment is as capable in its function as are the other components of a rig.

Other factors . . . All of the foregoing discussion of the factors in evaluating a drilling rig relate to manufacturer's data as the criteria for evaluation. There are three other factors—all without substantiation in catalogs and handbooks—which are equally if not more important when a contractor is to be selected for a drilling job.

● The first of these is the integrity of the contracting firm. Is the contractor truly concerned with serving his customer well? Can he discharge his financial responsibilities under the contract?

● The second is an offshoot of integrity. What are the contractor's policies regarding the upkeep of his equipment? It avails one very little to evaluate the power units on a rig from manufacturers' ratings if the engines are so badly worn that they only develop one-half their rated power.

● The third is the most important of these three: What class of personnel does the contractor employ to operate his rig? Are his personnel policies conducive to stable crews or does he ignore present-day management responsibilities towards employes with accompanying high turnover, apathetic crews, and disinterested drillers? It is true that alert, enthusiastic, and happy drilling crews can operate a mediocre drilling rig more effectively than a dissatisfied group can operate a first-rate outfit.

Method of evaluation . . . In conclusion, and merely as a suggestion, it is suggested that the following be consid-

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SOS (Slurry Oil Squeeze)—new DOWELL service for oil and gas wells—stopped water production completely, aided effectiveness of fracturing

Dowell's new Cementing Service—SOS (Slurry Oil Squeeze)*—is designed to provide a fast, low-cost means of ending troublesome water encroachment in oil and gas wells.

Production records have proved the effectiveness of SOS. For instance, one oil well completed in a sandstone formation was producing 200 barrels of salt water and only 3 barrels of oil per day. SOS by Dowell stopped the water completely and paved the way for a small gallonage Sandfrac† treatment. After the fracturing treatment, the well pumped 75 BOPD with no water.

Dowell engineers premix the entire batch of slurry for SOS in truck-mounted, paddle-mixing tanks. This equipment is specially designed to mix a uniform slurry—even in small batches. High-pressure triplex pumps are used to inject the slurry into the formation. The SOS slurry is made up of portland cement, a Dowell surface tension reducing agent and a non-aqueous carrying medium—for example, specially blended oils. The cement sets up only when contacted by formation water.

Contact the nearest Dowell office for more information on SOS or any of Dowell's many oil field services—in Venezuela, contact United Oilwell Service, S.A. Or write Dowell Incorporated, Tulsa 1, Oklahoma, Dept. G-11.

*A Service Mark of Dowell Incorporated
†Sandfrac is a registered service mark of Dowell Incorporated

services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

ered: Let us agree, for a particular well, that the factors for evaluation be assigned certain values as follows:

Draw works	12
Mud pumps	25
Power application	25
Derrick or mast	4
Mud-handling equipment	6
Drilling string	15
Miscellany	2
Intangible factors	11
Total	100

Now, let us assume that four different drilling rigs are available from four contractors, and that an evaluator, after considering all available facts, has assigned values as indicated in Table 1.

TABLE 1—COMPARISON OF DRILLING EQUIPMENT

	Optimum rating	Rig A	Rig B	Rig C	Rig D
Draw works	12	12	10	12	9
Mud pumps	25	18	20	21	25
Power application	25	20	25	20	23
Derrick or mast	4	4	4	0	4
Mud-handling equipment	6	4	5	4	6
Drilling string	15	13	13	15	15
Miscellany	2	2	2	2	2
Intangible factors	11	8	11	11	9
Total	100	81	90	85	93

If the application of values is done on a reasonable basis, Rig D should be selected. Even though its draw works is evaluated lowest, its mud pumping equipment has been rated highest. Rig C should not receive consideration due to the zero value applied to the derrick.

It is possible that the optimum values used will vary from field to field and from wildcat to wildcat.

Finally, it should be kept in mind that the drilling of oil wells is still a very inexact science. Equipment manufacturers have done a wonderful job in giving us better and better tools to work with, but each new well drilled, be it "post hole" or to 20,000 ft., presents a new challenge to our industry.

Acknowledgment

The author is grateful to the following men for their constructive criticism and helpful thoughts which aided materially in the development of this paper: W. F. Bates, Shell Oil Co.; H. A. Buchanan, Bell & Burden, Inc.; O. A. Graybeal, Sunray Oil Corp.; J. O. Hills, General Petroleum Corp.; Arthur Hodges, Loffland Brothers Co.; J. K. Kellogg, K. L. Kellogg & Sons; K. M. Nicolson, Standard Oil Co. of California; Gene Thompson, Humble Oil & Refining Co., and K. C. Vaughan, Union Oil Co. of California.

Why Standardize Blowout Preventers?

by F. E. Spencer

THE drilling industry gives an ever-increasing respect to blowout-prevention systems. No one can calculate the savings to the petroleum industry through the use of proper blowout control. Not only is there a greater retention of recoverable oil and gas, but a decreasing of fire hazards and danger to surrounding property. And, always, during any uncontrolled release of pressure from the bore, there is extreme danger to the men employed on or near the drill site.

Well, there are some fair reasons for installing a blowout preventer. Sure, and after it's installed the drilling foreman can try to figure out some way of squeezing in the time to train the rig personnel in the proper handling of the controls. And to make sure every new hand knows how to work the controls—and where the controls are located. For there are almost as great a variety of blowout preventer requirements, and control systems, as there are individuals specifying such equipment.

Need for standardization . . . Is this variety of a basic equipment good for our industry—or even desirable? Think, for yourself, of the unlimited opportunities for faulty use or misuse of blowout-preventer equipment because of unfamiliarity or lack of knowledge of such equipment and its controls. Of what use is this equipment, and the monetary investment it represents and protects, if its correct and complete use cannot be assured?

From the drilling contractor's point of view, standardization could promote other economies. Design of substructures, flow lines, hydraulic piping, and the like could be simplified and there would be little need for changes as the rig is moved from one job to another. And best of all, standardization would simplify the education of rig personnel by reducing the risk of error in the installation, testing, and maintenance. Standardization of blowout-control equipment will promote a maximum protection against blowouts. Crews—whether oil company or drilling contractor—moving from one rig to another, would find no mysteries in the cellar with standardized blowout-control equipment and standard installation, testing, and maintenance procedures.

The author is tool pusher with K. L. Kellogg & Sons. Paper presented at the Western Oil and Gas Association drilling section safety conference, Pacific Coast Club, Long Beach, Calif.

Following standardizations are recommended to promote safety and ease of handling:

1. Multistation manifolds should be assembled so that each individual station can be serviced or repaired without interfering with the functioning of the remaining stations.

2. All levers attached to four-way valves operate by turning right, or clockwise, to close blowout-control units, and to the left to open them.

3. Locate piping so that it will not be run over or backed into by heavy trucks.

4. Use only one size piping and fittings for blowout-control hookups and make certain that all are suitable for high-pressure service.

5. Provide adequate swing joints in the lines to prevent damage to piping by relative movement between the blowout-control units and the controls.

6. Power sources for operating blowout-control units should always be separate from the drilling engines.

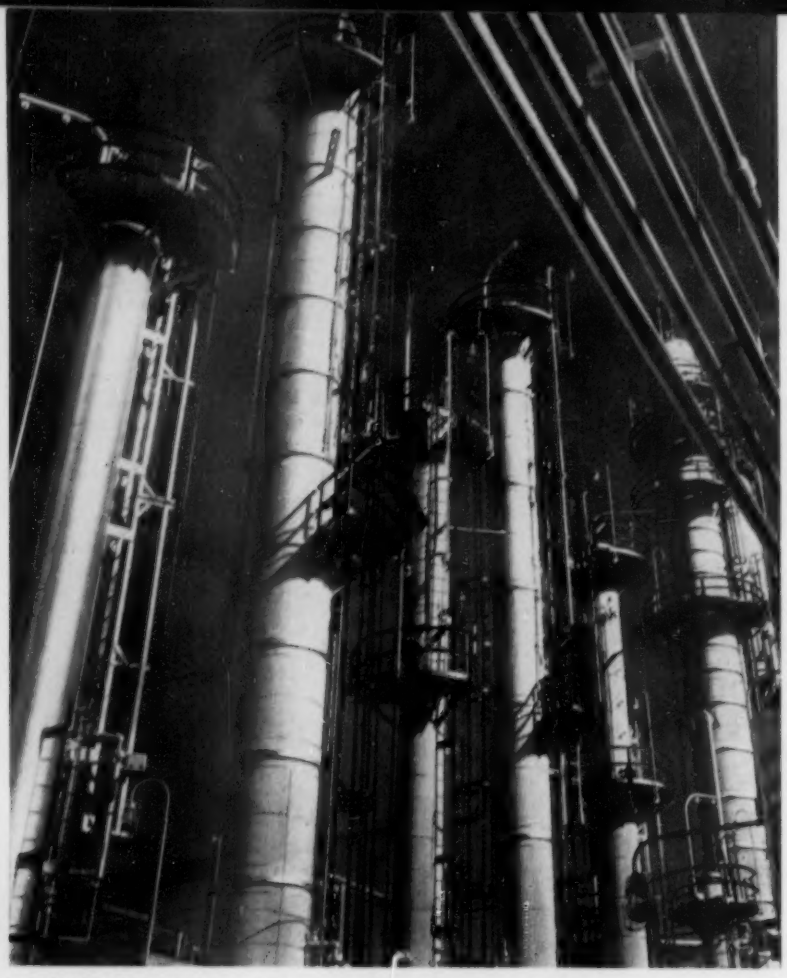
7. Mud pumps should never be used as a source of hydraulic power to operate the blowout-control system because it is practically impossible to hold a constant pressure on the system.

8. Last—and most important to the drilling contractor—a standardization of a hookup design that would meet the approval of all operators.

This is a part of the case for standardization of blowout-preventer requirements and their controls. Granted it is from the drilling contractor's viewpoint; but we **are** drilling contractors. And our bids must reflect the total cost of drilling. Lack of standardization of blowout-preventer requirements, and of blowout-preventer controls is a part of that cost.

And a further point in favor of standardization is the complex story of safety. Sure, we'll grant that safety is often an individual responsibility, and always the concern of direct supervision. But, since the entire drilling industry is a calculated risk, would it not be to the benefit of the entire industry if risks to life and equipment could be removed merely by the standardization of installation and controls of blowout preventers? Surely any equipment so vital to the economic and human safety of our industry **should** be standard in its requirements and in its control systems.

Such a goal is technologically sound—further, it is sound safety.



MAKING AROMATICS . . . Cosden Petroleum Corp. has a profitable aromatics operation at its Big Spring, Tex., refinery. Shown here is the B.T.X. plant—moving left to right are the charge stripper, toluene column, light S.R. stabilizer, benzene column, xylene column, Udex stripper, and Udex extractor. (For more on the process see The Oil and Gas Journal, January 4, 1954, page 72.)

How a Small Company Got Into Petrochemicals

"Why burn up potential profits?" Cosden officials asked themselves as they searched for additional products that could be derived from crude oil.

by W. K. Jackson and D. M. Krausse

THE field of joint effort between small refiners and chemical companies has been neglected. It is not necessary for the refiner to build a chemical distribution organization nor is it necessary for the chemical company to build his own raw-material source.

Authors are with Cosden Petroleum Corp., Big Spring, Tex. From paper presented at Western Petroleum Refiners Association annual meeting, March 28-30, 1955, at San Antonio.

If each respects the problems of the other, a fair division of the profits can be negotiated. It makes sound sense that the two should join forces on any project which would result in mutual benefit.

- In 1946, Cosden Petroleum Corp. was not in any way involved in chemical operations.
- Today, chemicals account for a very substantial portion of the net profit of the company. Total capital investment for chemical operations by Cosden and others adjacent to the refinery today amounts to considerably over 6 million dollars.
- The story about how a relatively small oil company became successful in petrochemical operations may prove interesting.

Diversification

The phrase "Why burn it up?" effectively represents the basic philosophy of Cosden Petroleum Corp. toward any legitimate diversification. Any product derived from crude oil is within the legitimate province of a refiner.

Fundamentally, there is little difference between a polymerization process to make a fuel for the gasoline market or one to make a chemical for the chemical market. The difference lies in the type of market and not the type of process.

The octane race to develop more and better gasolines led to the improvements in process technology which in themselves were chemical operations for producing gasolines. These new processes also yield hydrocarbons of types and forms previously unavailable from simpler refining processes.

Furthermore, the chemical business itself began to grow rapidly. Development of synthetic rubber, plastics, and other commodities necessitated new sources of raw material in large quantities.

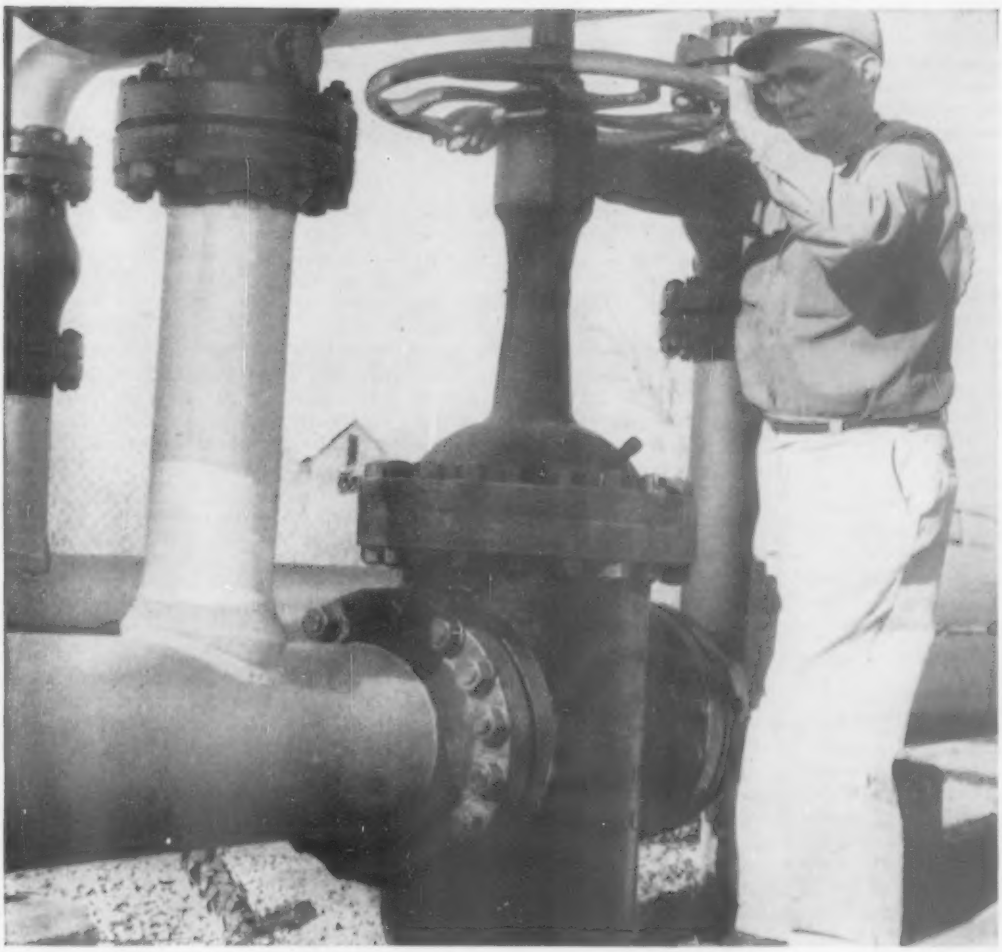
Some of the larger refining companies recognized early and took advantage of this ever-increasing ability to diversify. It takes courage to be a pioneer in any new form of diversification. This courage comes either from profound convictions, a healthy bank account, or government backing. All three of these plus increased markets have been present since 1940, hence the spectacular rise of petrochemicals.

It is our conviction that a small refiner can profitably exploit petrochemicals opportunities if he exercises normal business prudence and recognizes that he is actually already experienced in chemical-manufacturing techniques. Why burn up potential profits?

How Cosden Diversified

Until late 1946, Cosden produced only various sorts of fuels. It was felt that process flexibility would lead to greater adaptability to changing markets as well as to greater product diversification. Such conventional diversifications as asphalt and L.P.G. were inaugurated in order to realize maximum dollar recovery from crude.

1. Cresylic acid . . . Insufficient capital prevented the purchase of an ex-



Easy does it...year after year with this Crane pipe-line valve

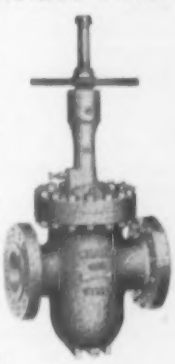
THE CASE HISTORY—More than 3 years ago the Phillips Pipe Line Co. installed this Crane conduit valve in a junction manifold on its 10-inch crude line to Borger, from Yale Station, Oklahoma. How's it doing?

Operated every day or two until a few months ago, this Crane double-seating, grease-packed valve has always responded smoothly and easily to the handwheel—never sticking. Under former frequent usage as now with infrequent operation, it has never leaked at the bonnet joint or packing chamber—remains tight as new at the seats. This Crane valve—because its pressurized stuffing box eliminates leakage—is clean, unstained.

On gas and oil, these Crane valves are making big savings in operating costs. They're the leading value for pipe line service, and thrifty buyers know it. Crane Co., General Offices, Chicago 5, Illinois. Branches and Wholesalers in all industrial areas.

CLASS 600 STEEL PIPE-LINE GATE VALVES

Grease packing in body and bonnet assures thorough internal lubrication for easy operation. Parallel disc design gives tight closure; eliminates seat leakage. Spring plates in contact with disc faces keep foreign matter out of body. When open, conduit ports through disc give straight-line, unrestricted flow. Full-way or Venturi patterns; sizes 2 to 30 in. Literature sent by mail, or ask your Crane Representative.



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CRANE'S FIRST CENTURY...1855-1955

isting chemical company or the establishment of a well-staffed subsidiary; consequently Cosden decided to enter chemical operations rather cautiously. Late in 1946, an experimental program was instituted to investigate the possibility of the recovery and sale of byproduct chemicals from refinery waste. The first such operation was the recovery of cresylic acid from spent caustic soda. Slightly over $8,000 was invested. This very small operation not only paid its own way, but also produced sufficient revenue for further experimental work, and even produced a small profit.

Spent caustic soda from the treating of cracked gasoline was passed countercurrently through a small packed tower where the soda was neutralized by waste hydrogen sulfide gas. The spent caustic emerging from this tower was allowed to settle and a cresylic acid concentrate separated to the top. This concentrate was then distilled in a small fractionating column and the distillate acids were sold into the chemical market.

2. Mercaptans . . . Another byproduct, mercaptans, was available in a very crude form from the Unisol treater. These mercaptans had previously been burned as boiler fuel. It was known that mercaptans were widely used as additives for odorizing natural gas and L.P.G. A brief market study was made and the decision reached that it would be more profitable to produce specification odorants for marketing by an already established company rather than for Cosden to enter directly into the sale of these products.

Selling odorants . . . The sale of gas odorants is something in the nature of a drugstore business, wherein relatively small volumes of materials are sold to numerous consumers. In each case, a great deal of specialized knowledge is required by the salesman. The cost of building up such a specialized sales staff for a small volume of a single product could not be justified if it were possible to produce these mercaptans for sale by an already established marketer.

Making a deal . . . A process deal was made with Sharples Chemical Co., one of the earliest producers of gas odorants in the United States, whereby Cosden would install necessary equipment for the recovery and distillation of mercaptans with specified boiling ranges. Sharples arranged to ship to Cosden certain synthetic mercaptans which were made in their own plant. Cosden then undertook to blend the natural and the synthetic mercaptans to odorant specifications. After blending, Cosden drummed, stenciled, and shipped the mercaptans directly to the customer as well as to warehouse storage at Sharples.

"It is our conviction that a small refiner can profitably exploit petrochemical opportunities if he exercises normal business prudence and recognizes that he is actually already experienced in chemical-manufacturing techniques."

Although this operation was very small scale, it established the validity of the concept of making process deals with existing chemical companies. In this way, Cosden was able to concentrate on processing alone and not also on selling, whereas the chemical company already well established in its own field was able to augment its supplies of material without committing capital.

Again this small-scale operation produced only a relatively small profit, but it did pay its way and helped pay other experimental costs on other projects.

Many of these other projects were complete failures. But even the failures served a useful purpose in that they enabled our personnel to become better acquainted with personnel in chemical companies and to become more confident in negotiations dealing with chemical production. Some opportunities were lost not because of timidity about the manufacturing process but because of timidity about the marketing.

The practice and experience obtained in small byproduct operations and chemical studies emphasized the fundamental truth that any logical product which can be derived from crude oil is well within the province of a refinery operation. Management began to accept that there is no fundamental difference in making a decision on whether to produce asphalt, coke, lube oil, L.P.G., chemicals, or any other product which can be derived from our prime raw material.

3. Carbon-black oil . . . The first really significant petroleum chemical development by Cosden was a product which fell somewhere between conventional refinery operations and petrochemical operations. This was in the production of a special carbon-black oil for use in a furnace-type carbon-black plant.

Somewhat pessimistic estimates of the future in residual oil markets led Cosden in 1949 to investigate the possibility of alternate uses for residual fuels. During the period of investigation of this project, we learned that research, performed by a large producer of carbon black, indicated that not only superior blacks could be produced from a high-aromatic, residual-type fuel oil, but also that the over-all economics could possibly be more favorable than in the case of a typical distillate-type fuel.

A joint program was initiated to develop such a residual fuel. Cosden was naturally quite interested in the project because at that time the principal customers for residual fuel oil were the railroads, which were rapidly converting to diesel power.

Petrochemical raw material . . . As a result of the joint research and experimental program, it was found that the most desirable carbon-black fuel oil could be produced by thermally cracking selected feed stocks obtained from various units, especially the catalytic cracker. It was further proved that superior carbon blacks could be produced with excellent yields in a specially designed carbon-black furnace from this special oil.

A 10-year contract for the manufacture and sale of this special carbon-black fuel was made in the latter part of 1950 and in March 1951 a furnace-type plant of 50 million pounds per year capacity was completed adjacent to Cosden's Big Spring refinery. This carbon-black plant represents a substantial investment in what might well be classified as a chemical operation utilizing a specially prepared raw material provided by Cosden. Such interdependency requires that mutual confidence be high.

4. High-purity aromatics . . . The requirement for more gasoline and higher octanes led Cosden to investigate various new reforming operations. The Platforming process looked like a good answer to the problem of obtaining a higher-octane gasoline and, at the same time, the Udex process showed excellent possibilities for the recovery of aromatics known to be present in our streams. Therefore, based on process expectations of the Platforming-Udex combination, preliminary economic studies indicated that the unusually high aromatic and naphthenic content of the raw material would offset the inland freight differential existing against the price of the product.

Because of the confidence and experience gained in previous smaller though not wholly unrelated chemical ventures, it was decided to enter this new field of aromatics production. A

5-year contract was obtained from one of the larger chemical companies and covered one-half of the anticipated production of benzene and xylene. This was done to support construction of the facilities.

However, since these aromatics were to be produced on a much larger scale than the previous specialty chemicals, it was decided that Cosden would enter the field of direct selling for these particular commodities. This new and rather significant step does not mean that we intend to abandon our old policy of making process deals when such deals are more sensible. Furthermore, the volume is enough to justify a sales staff.

The Udex extraction unit makes a type separation between the aromatic and nonaromatic portion of the feed with extremely high selectivity. The nonaromatic portion of the whole extract does not exceed 0.2 per cent by weight with over-all aromatic recovery in excess of 96 per cent. The extract is clay treated for acid wash color and then fractionated in a series of three columns into specification benzene, toluene, and xylene. Simultaneous production of the three aromatics in a simple fractionation step is possible only because of the extreme purity of the extract. This installation at Cosden was the first of its kind. The usual separate treating and rerunning of each product has been eliminated in the Udex process. *(See The Oil and Gas Journal, January 4, 1954, page 72.)*

5. Polybutenes . . . The acquaintanceship obtained with one of the eastern chemical companies through earlier development projects and discussions eventually led to the decision whereby Cosden would produce polybutenes for the account of this company. Polybutenes are high-viscosity, high-molecular-weight polymers made predominantly from isobutylene. The product itself is nothing new in the market but original work was required at Big Spring in order to adapt the process to the particular streams available.

These high-viscosity polymers are used in pressure-sensitive adhesives, surface coatings, resin modifiers, asphalt specialties, and lubricating-oil additives. The process deal in this case involves sale of Cosden's entire production of several grades of polybutene to the "chemical company partner."

6. P-xylene . . . Because of the availability of nearly 7 million gallons a year of mixed xylenes the possibility of diversification into isomer separation became interesting.

Phillips Petroleum Co. developed new and revolutionary fractional crystallization process for the separation of para-xylene. Discussion between the Cosden and Phillips managements led to a decision for a joint venture. Cosden had the xylenes and Phillips had the process.

Plant location . . . It was advantageous to locate the plant at Big Spring because of several reasons: (1) the long step from pilot plant to commercial production is an uncertain one at best and this made it difficult for Phillips to give a firm commitment for a specified amount of mixed xylenes; (2) Phillips was interested only in the para-xylene and did not desire to market the residual xylenes; and (3) it was estimated that by locating the plant at Big Spring the freight saving alone would be equal to the plant investment in less than 5 years.

Phillips agreed to design and build a commercial para-xylene extraction unit on ground leased from Cosden and adjacent to Cosden's B.T.X. plant. Cosden agreed to operate and maintain the unit and sell the entire production of para-xylene to Phillips at a stipulated price. Cosden's price to Phillips reflects the value of the mixed-xylene feed stocks plus an operating fee. Phillips recovers its development cost and plant investment by the margin of profit from a still higher price. Thus, you can see that in this case we reverted to our previous policy of making process deals.

Pure p-xylene . . . The first tank car of para-xylene was shipped from Big Spring in December 1953. Plant production runs 98.7 per cent purity which is considerably higher than the 95 per cent purity available from other sources. Para-xylene recovery closely approaching the theoretical is maintained, and the commercial success of the process is now assured.

7. Other xylenes? . . . Studies are currently under way at Cosden for the possibility of recovery and use of the other xylene isomers. These other isomers can be converted into chemicals which are currently used widely in the plastics and synthetic fiber fields.

The requirements and uses of such new chemical building blocks are growing rapidly. Their separation, if economical, represents another form of diversification of end products from crude oil.

Venturing into the petrochemicals field does not constitute any major departure from the normal and regular habits of our business. The profitability of a petrochemical operation must be based on exactly the same type of economic consideration as the profitability of any other type of refinery process.

BOOKS

WILLISTON BASIN WILDCAT MAP. Published by Midland Map Co., 412 No. Big Spring, Midland, Tex. Over-all size 26 by 28-in. Scale 1-in equals 64,000 ft. $3.

Midland Map Co. issues a Williston basin map every other month that covers the wildcat activity in both the United States and Canadian portions of the Williston basin. The map shows all current wildcats along with their correct locations, distance from production, and relative position from new discoveries, and major roads. Pertinent well data and new producing areas are indicated.

REGIONAL TECTONICS OF THE COLORADO PLATEAU AND RELATIONSHIP TO THE ORIGIN AND DISTRIBUTION OF URANIUM. By V. C. Kelley. Published by University of New Mexico Press, Albuquerque, N. M. 120 pp., $2.

In this book a new tectonic map of most of the Colorado Plateau is presented. The report consists of three parts: (1) A description and analysis of the regional tectonics; (2) a geologic history, and (3) a discussion of the tectonic influence on distribution and origin of uranium. Although little if any direct relationship apparently exists between regional structure and uranium distribution, the tectonic events of the past evidently have had a most important bearing upon the distribution and origin of the uranium ore.

NELSON REFINERY CONSTRUCTION INDEX

Appears in the Engineering Section in the first issue each month.

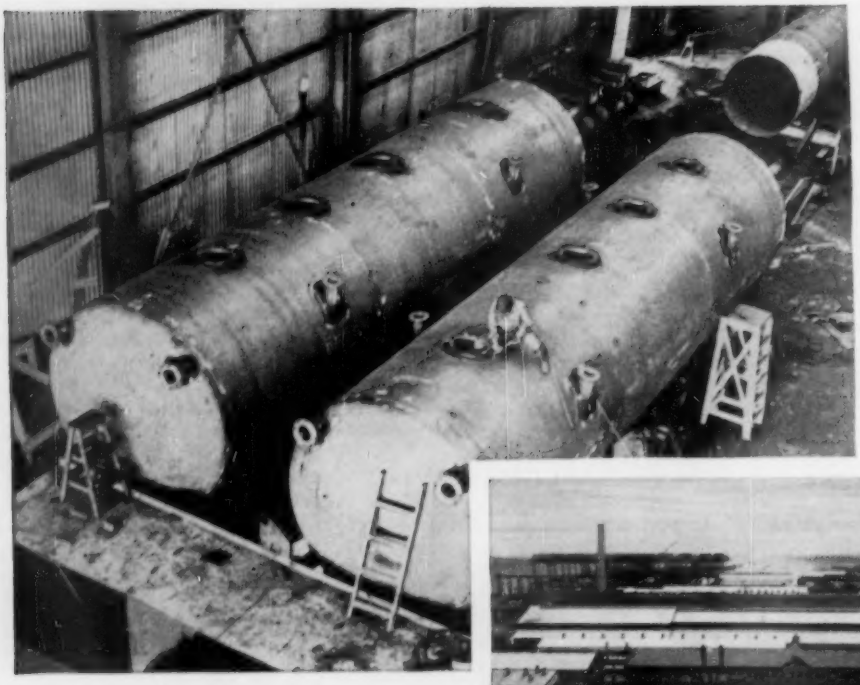
Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.

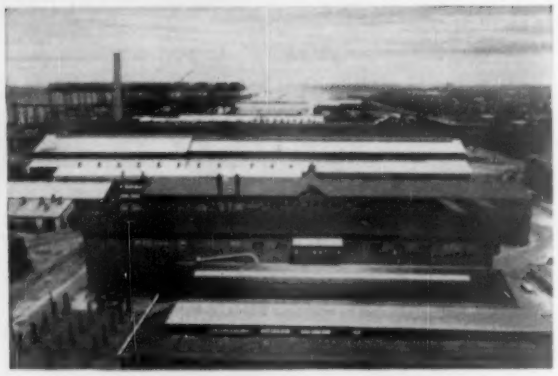
The Index was explained July 7, 1952 (page 105) as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issues of the months of January, April, July, and October.

Index (1946=100)

	1948	1950	1952	1953	1954	March 1955
Pumps, compressors, etc.	127.0	138.2	155.6	162.5	166.5	†167.2
Electrical machinery	127.6	134.9	154.2	156.4	160.0	†160.9
Internal-combustion engines	116.9	126.0	146.5	148.1	150.5	†150.2
Instruments	120.0	127.8	146.2	151.8	154.6	158.1
Heat exchangers	130.0	140.0	165.8	174.9	171.7	153.4
Miscellaneous equipment average	*122.1	*126.2	153.3	158.8	160.7	158.0
Materials component	139.3	149.5	164.3	172.4	174.6	171.1
Labor component	128.0	144.0	163.1	174.2	183.3	186.4
Nelson construction index	132.5	146.2	163.6	173.5	179.8	180.3

*Used in computing the Nelson Index until April 1952. These are slightly different than the average of Miscellaneous Equipment Items shown above. †Preliminary.





A Mile of Shops – Each shop is devoted to a special type of heavy production. Included are complete Machine Shops, casting, forging and other facilities which offer all of the advantages of the execution of the complete job.

A half mile of pressure vessels

These are two of seventy – over ½ mile – of 38½-foot vacuum tank casings built to meet the quality requirements of a well-known processor.

The buyer also benefits from many savings made possible by Newport News extensive heavy fabrication equipment and the sixty years experience in using it.

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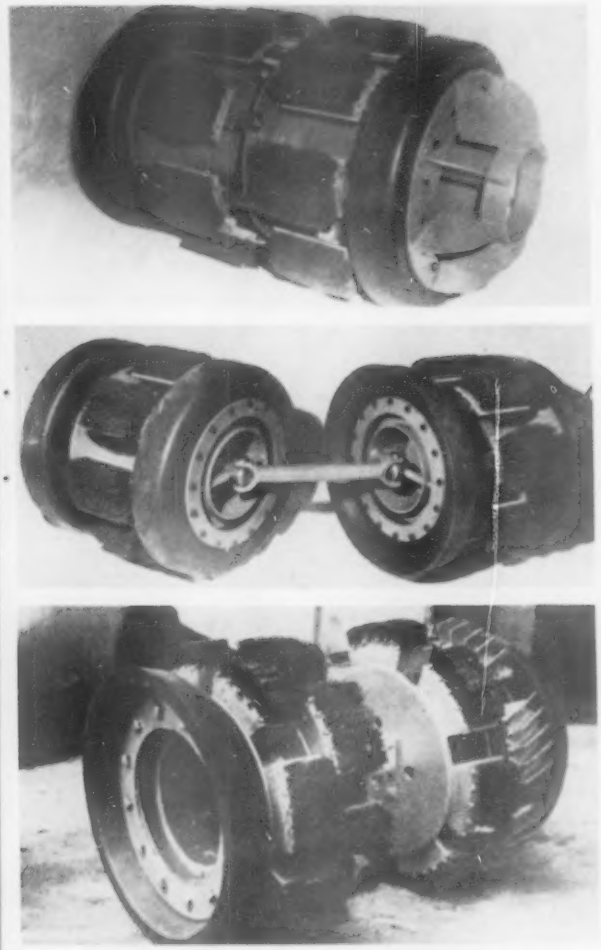
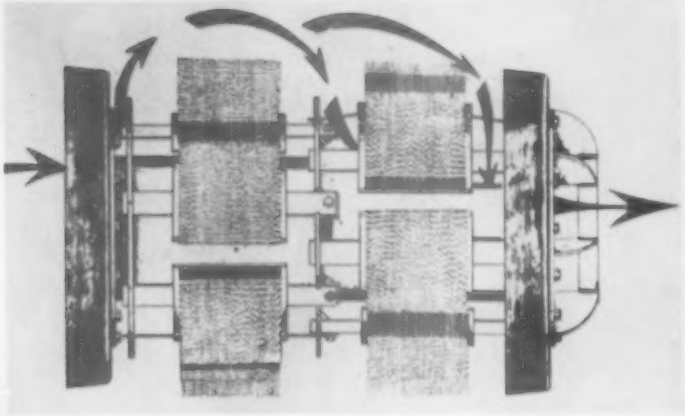
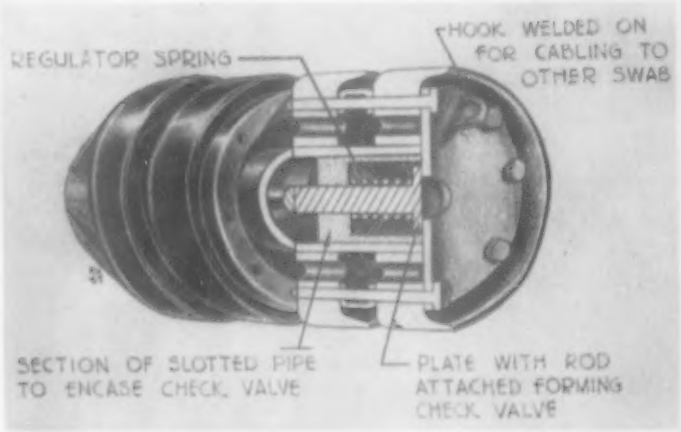


NEWER-TYPE PIGS have many advantages over old-style go-devils. Fig. 1.



GAS BYPASSING is very desirable in washing a line. This gives more agitation and better cleaning. Fig. 2.


HOOK WELDED ON FOR CABLING TO OTHER SWAB
REGULATOR SPRING
SECTION OF SLOTTED PIPE TO ENCASE CHECK VALVE
PLATE WITH ROD ATTACHED FORMING CHECK VALVE

CHECK VALVES made from pressure-regulator springs should be in body of line-drying swab. Fig. 3.

WASH DAY ON THE PIPELINE

Soap and Water Clean Dirty Pipelines Too

Here's how El Paso Natural uses a detergent-water method of line cleaning. In one case the method raised line efficiency by 22 per cent and promises a yearly savings of $48,000 on 50 miles of line

by Clinton McClure

ANY method of blowdown cleaning of a gas pipeline is expensive. Thus, if the line has to be blown down for cleaning, the quickest and most effective method should be used. The detergent-water method described here will produce the best results with least down time.

Auther is with El Paso Natural Gas Co. Paper presented at Gas Supply, Transmission, and Storage Conference, American Gas Association, Pittsburgh.

Beginning in 1948 El Paso Natural Gas Co. tried the pipeline construction method of pigging lines that had been in service for some time. This process consisted of blowing down the line, cutting into it, and running a go-devil or a steel-wire pig without a washing agent. Results were dependent upon the flow efficiency before pigging. Lines with efficiencies 40 per cent below maximum were improved 5 per cent. Those with efficiencies above this were increased from 1 to 5 per cent per pig run. Down time and labor expense for more than two pig runs made this method uneconomical.

These pipelines contained lubricating oil, water, iron sulfide, dirt, amine,

80 million miles of road testing in trucks and passenger cars is the background for Ethyl's development of new "Motor Plus." Road tests of the new compound, totaling 4,000,000 miles, confirmed its effectiveness.
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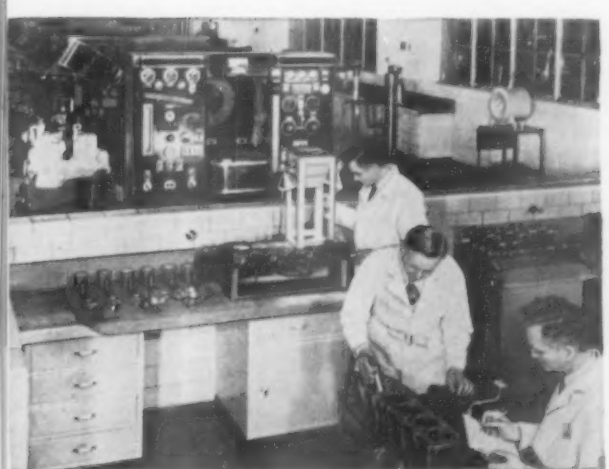
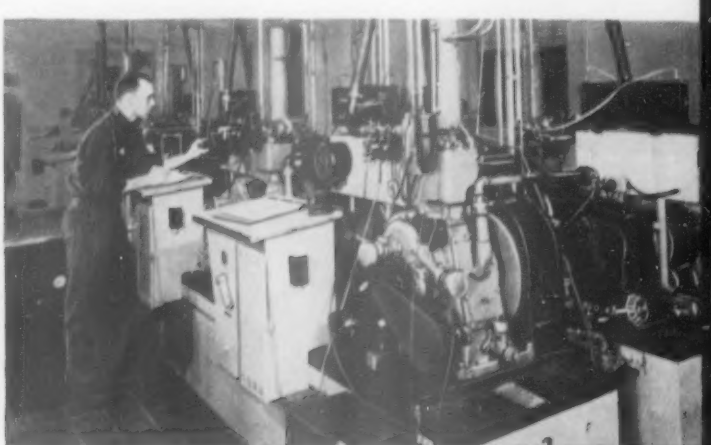


500,000 total hours of testing antiknock fluids on multicylinder engines preceded the development of Ethyl's new "Motor Plus."



350,000 hours of single-cylinder testing gave our people the necessary background to develop Ethyl's new antiknock formula. Several thousand hours were devoted to the proving of "Motor Plus" alone.

and steel shavings. These materials formed a sticky, highly viscous mixture that adhered to the pipe wall. We then tried small amounts of water pushed by the pig. This method was more effective than the dry runs previously used.

Detergents tried . . . The beginning of the detergent-water method came in 1949. A sample of pipe from the original area was brought into the water lab and different type detergents with water were used to determine the most effective one in removing the mixture. A 7.0 to 9.6-pH detergent, used in many cafeterias, was the most effective.

The remainder of improvements were to be made in the field. Water from different sources, depending upon the location of the pipe to be cleaned, determined the amount of detergent needed. The only test made was to add detergent to the water until only a slight agitation was needed to make rich suds. Lack of suds at the discharge end usually meant more oil was present than anticipated and another detergent run was made to correct the situation. Other sections carrying gas from the same sources were treated as the first one.

The cleaning instruments . . . The go-devil, as it was known in the early pipeline-cleaning days, became a part of the gas industry. This instrument, which was so effective in oil or crude lines, was the first thought in propelled instruments to be used in gas lines.

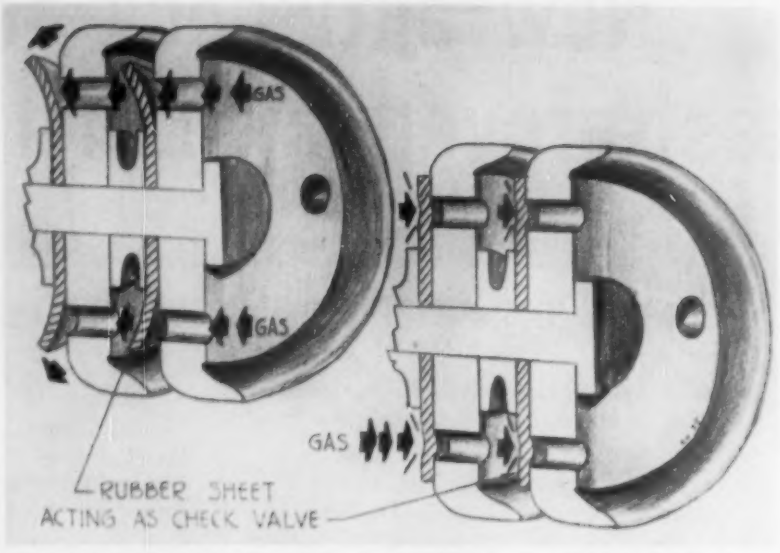
Due to the absence of paraffin in most gas lines, this instrument was not too effective. It is still used by the company in detergent cleaning where there is a possibility of siphon drips with exact locations unknown. It precedes the detergent run as an exploratory instrument.

Old-style wire-brush pigs are still used if a sufficient number of them are available. It is the policy of El Paso Natural that the total brush surface must equal the brush surface on the newer-style pigs and they are used in series. They have the following disadvantages:

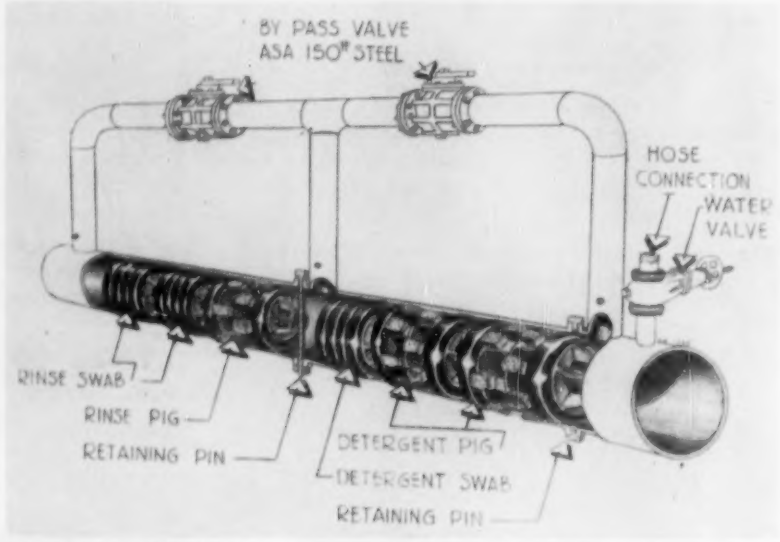
1. Rigidly mounted brushes are used. Thus any wear of the brushes from one end of the pig run to the other means a loss of force on the pipe wall.

2. Any obstruction in the pipe generally removes part of the brushes from the holding recess.

3. Rotation of the pig is necessary to prevent uneven wearing of the brushes. So-called rotating pigs do not rotate enough to prevent this.



RUBBER SHEETS over perforations in cups form different type of check valve for smaller pigs. Fig. 4.



SIMPLE CONTROL JOINT can be coupled into line and made long enough to house any number of pigs desired. Fig. 5.

4. Without special equipment, these pigs are difficult to assemble properly.

Newer pigs . . . The new-style pigs shown in Fig 1 are a tremendous improvement over the old ones. They have the following advantages.

1. Any wear of the brushes is made up by the compensating stiff steel spring. Uniform force on the pipe wall is obtained from one end of the pipe to the other.

2. Rotation is not necessary since the pig is lighter in weight and the springs keep equal pressure on the wall.

3. They ride over any short, hard obstruction without damaging the brushes or missing any pipe contact thereafter.

Improvement of the body structure and the spring steel is desired. Some types of wear-compensating pigs are difficult to get into the open end of the pipe.

The rigid-brush type can better be used without a pig catcher than the spring-mounted brush type. Repair of damages resulting from the discharge to atmosphere is less expensive using the rigid-brush type.

If either type pig is used, the body should have a gas bypass, as in Fig. 2. On smaller sizes, the cups should be

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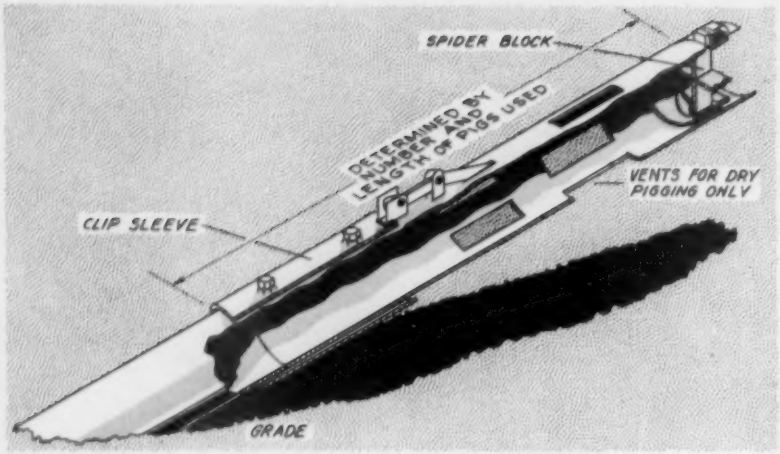

BLOW-JOINT is coupled in at other end of line. It can be used for wet or dry pigging and will prevent damage to pigs. Fig. 6.

perforated for the passage of some gas through the pig.

Line drying . . . Water recovery is the important issue in detergent-water cleaning. This requires an instrument called a squeegee or swab which may have two, three, or four cups each. The company uses the four-cup swabs.

Until recently it was believed that the swabs should be completely sealed. The results of 50 miles of detergent cleaning in 1954 showed that the vented swabs and pigs made a definite improvement in cleaning. The reason for the improvement was that the gas passing through the swabs and pigs provided more agitation to the water and detergent. The perforated swabs must be equipped with some type of check valve to prevent any water from coming back through them and remaining in the pipe. See Fig. 3.

The check valves in the swabs should be fabricated to open at the following pressures:

16-in.	12 psig.
18-in.	11 psig.
20-in.	10 psig.
24-in.	8 psig.
26-in.	7 psig.
30-in.	5 psig.

Gas-pressure-regulator springs are ideal for use in these check valves. The plate diameter may be calculated as follows:

$$\text{Plate diameter} = \left[\frac{\text{Diaphragm area (in.}^2\text{)} \times \text{spring rating (lb./in.}^2\text{)}}{\text{Opening pressure (lb./in.}^2\text{)}}\right]^{1/2}$$

The plate minimum diameter should be limited to 20 per cent of the inside diameter of the pipe. This insures passage of enough gas to mix the detergent-water solution adequately.

On the small-size swabs a different type check valve can be arranged. A rubber sheet sandwiched between the spacers and main cups will act as a check. This is shown in Fig. 4.

The venting of the pigs and swabs decreases the pressure differential across the cups. But less differential is needed because the gas passing through keeps the water head decreased. The decreased differential pressure will increase the total running distance before the cups will have to be replaced. A good condition of the cups is required to remove all the water from the pipe.

The swabs and pigs used in the rinse run must be perforated also.

Equipment . . . The following equipment is necessary in detergent cleaning:

1. Pig control joint with couplings.
2. Blow-joint assembly.
3. Water-storage tanks (for use in remote sections).
4. Pump of sufficient size to pump in water in 30 minutes.
5. Hose or pipe for pump and storage tanks.
6. Excavating equipment for bell holes.
7. A minimum of two welding machines with cutting torches.
8. Large mixing funnel or mixing tank.
9. One joint pipe (for pipeline).
10. Four line-up clamps.
11. Two pipe-lifting machines (minimum).
12. Trucks sufficient for hauling equipment and supplies.
13. One pressure recorder (0-50 or 0-100 psi.).
14. Three four-cup swabs or equal.
15. Three wear-compensating pigs or equal.
16. One exploratory pig if line has never been pigged. This should be of same type and length used with detergent and rinse.

All pigging equipment should be carried to the site and prepared before the blowdown is begun. Pigs and swabs should be inserted in the control joint previous to the blowdown.

The water and detergent are the only supplies needed before the blowdown.

Preparation of site . . . Bell holes must be dug at each end of the section to be cleaned. Select the end for the control joint where the best natural sag in the terrain is available. The sag permits the holdup of water to keep it from running too far down the pipeline before the pigs catch up with it.

The extra joint of pipe is placed at one end to be used after the cleaning operation is finished. The joint removed at this end is cut slightly longer than needed for the other end. This saves cutting more than one joint from stock.

Operation . . . After the blowdown is complete, cutting should begin at the high end first. The cuts at the blow-joint end need not be over five diameters apart to accommodate the blow joint. The cuts at the control-joint end should be about 1 in. longer than the control joint. The blow joint is welded on and the control joint coupled in. A typical control joint is shown in Fig. 5.

The pressure recorder is connected to the control joint nearest the exploratory pig for the actual pressure admitted to it. A 0-100-psi. recorder is used on pigs up to 16 in. The 0-50-psi. recorder is used on larger sizes.

After all work is completed and connections are made, pressure is admitted to the exploratory pig via the bypass on the control joint. The speed of the exploratory pig is not too important except in cases of possible line rupture at bends or obstructions.

After the exploratory pig has passed through and the pressure is bled down, the water-hole valve on the control joint is opened. The funnel is inserted and gravity feed from the water tank is admitted through the funnel. The detergent is added by the shovelful to mix with the first 200 gal. of water; 75 lb. of detergent per 1,000 gal. of water will insure plenty of suds.

After the amount of detergent needed has been mixed with the water, the funnel is removed and the pump discharge connected to the water-hole valve.

The amount of water required is

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500 ft. of water-wall contact. More water than this is for the better as long as there is one cup per 50 ft. of water-wall contact on the swabs. The formula for 500 ft. of water wall contact is:

$$\text{Gal. required} = 20.401\ (\text{i.d.})^2$$

i.d. = inside diameter in inches.

Upon completion of the filling procedure and the spare blow-joint insertion, the detergent-water run is ready. A listening post is established at a point about one-third the total travel. The front retaining pin on the control joint is pulled and pressure is admitted.

An observation of the pig departure pressure is made and 10 per cent is added for the propelling pressure. An 8 to 12 m.p.h. speed is desirable. The one-third-point arrival time determines the amount of pressure necessary to be added or deducted. Constant changing of the propelling pressure is not desirable. The progress of the pigs can not be determined if this is practiced.

The foreman in charge of this operation **must** bear in mind that considerable time and money have already been expended. Attempting to decrease the down time by fast pig runs might jeopardize the results of this cleaning job.

The pigs and swabs being perforated cause the suds and water discharge to come in surges. The first portion of the discharged mixture is generally the cleaner appearing suds. As the pigs approach the blow joint the mixture darkens. Upon entrance of the pigs in the blow joint it is blown off and the entire open end of the pipe bleeds off the pressure. A blowdown joint used by the company is shown in Fig. 6.

Rinsing . . . The same amount of clean water is then pumped in ahead of the rinse pig and swabs at the control joint. The second retaining pin is removed and the pressure is admitted. In most cases of medium heavy deposits in the pipeline, the pressure required to propel the rinse instruments is greater than that in the detergent run. The two reasons for this are:

1. More cups in action on the swabs.
2. The detergent has penetrated into the deposits, loosened them, and the rinse run carries them out.

Again speed regulation can be attained by timing at the one-third point and correcting. The discharged mixture of the rinse run contains more of the pipeline contaminant. The pig speed in this run is also 8 to 12 m.p.h. average.

After discharge of the rinse swabs and the completion of the blowdown, the blow-joint assembly and control joint are removed. From this point on, the procedure is the same old story of getting the line prepared to put back in service.

The total operation requires 8 to 12 hours down time.

Water disposal . . . The water disposal using this method may become a problem in farm area or grasslands where the landowner might object. Damages may be decreased by ditching out of the area or a large pit may be dug. The manner of removing a specified amount of pipeline "crud" has little to do with the damages necessary to be paid. The water detergent-crud mixture is as easy to control as the dust or dry mixture that would be discharged using the dry method. The risk of fire damages is much less using the detergent-water method.

Limitations . . . The pig run using detergents should not exceed 10 miles. If more than a 10-mile run is necessary add water and detergent proportionally. This has been done but the results were not those obtained under 10-mile runs.

The 7.0 to 9.6-pH detergent does not cover all requirements for this application. The detergent must contain an abundance of wetting agents.

The check valves installed in the swabs must not require more pressure to open than is required to propel the pig.

Costs . . . Listed are the cost per mile for various pipe diameters:

30-in. o.d.	$346
26-in o.d.	325
16-in o.d.	282
6⅝-in o.d.	250

These figures do not include the cost of gas from the blowdown or down-time charges. In all cases the water-haul distance has varied from 5 to 30 miles. The hauling distance is a large factor in the cost of cleaning by this method.

TABLE 1

Pipe o.d. in.	Section length in miles	Efficiency* per cent Before	After	Increase
8⅝	7.91	76.6	86.5	9.9
8⅝	7.99	75.1	87.1	12.0
8⅝	8.33	80.4	90.3	9.9
8⅝	7.85	73.2	82.6	9.4
16	9.47	82.2	89.8	7.6
16	7.48	84.9	91.5	6.6
16	9.47	80.4	86.1	5.7
16	7.48	73.0	82.2	9.2
16	10.13	72.2	87.5	15.3
16	9.52	72.7	86.5	13.8
26	8.022	85.6	91.4	5.8
26	7.876	75.4	86.2	10.8
26	8.106	80.1	87.5	7.4
26	9.095	77.7	84.1	6.4
26	9.15	69.8	84.4	14.6
26	8.68	67.2	83.7	16.5
Average		76.6	86.7	10.1

*New pipe efficiency = 92 per cent

TABLE 2

Section length in miles	Efficiency* per cent Before	After	Increase
8.070	64.8	86.4	21.6
9.152	60.9	91.4	30.5
8.681	53.9	84.2	30.3
8.795	81.1	89.4	8.3
8.580	84.2	92.6	8.4
8.604	81.3	90.8	9.5
Average	67.5	90.3	22.8

*New pipe efficiency = 92 per cent

Results . . . The results of cleaning by this method from 1950 to 1954 are shown in Table 1.

During 1954 the company cleaned six adjacent sections of 26-in. o.d. line totaling 51.88 miles. The results are shown in Table 2.

The main reason for the large increase over previous pigging can be attributed to the vented swabs with the check valve. Better agitation of the detergent and water was obtained.

With the proper procedure and the desire to do an excellent job this method will pay out. The company cannot attribute any line or regulator freezeups to this operation up to the present time.

The 1954 pigging value is shown below. Actual operating horsepower was obtained before and after the pigging:

Horsepower used at upstream end before pigging to pump 281 M.M. c.f.d.	11,000
Horsepower used at downstream end before pigging to pump 281 M.M. c.f.d.	5,100
Horsepower used at upstream end after pigging to pump 330 M.M. c.f.d.	8,900
Horsepower used at downstream end after pigging to pump 330 M.M. c.f.d.	2,900
Difference in horsepower at upstream end	2,100
Operating cost per year at upstream end (additional) at $20.60 per hp.	$43,260
Difference in horsepower at downstream end	2,200
Operating cost per year at downstream end (additional) at $15.00 per hp.	$33,000
Total operating cost for horsepower	$76,260
Total pigging cost	28,000
Difference	$48,260

In addition to the horsepower savings, 49 M.M.c.f.d. additional gas can be transmitted.

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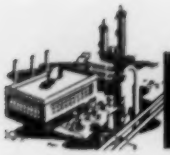

THE FOREMAN'S PAGE

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JOB IMPROVEMENT FOR THE PROCESS FOREMAN—11

Watch These Factors in Designing Heat Exchangers

IN this and the next installment, let's consider four phases in the mechanical design of heat exchangers: pressure-vessel code requirements, selection of materials of construction, design-features of standard and of special exchangers, and fabrication methods and problems. First of all . . .

Q. Which pressure-vessel codes do most heat exchangers conform to?

A. The design and fabrication of almost all heat exchangers follows one of two pressure-vessel codes. These are the 1951 A.P.I.-A.S.M.E. code for unfired pressure vessels, and the 1952 A.S.M.E. boiler and pressure-vessel code, Section VIII. Customer preference or local laws determine the code. Some localities have special requirements. The user should always specify the code because he is familiar with the local practice.

Service . . . Exchangers in air service are usually built to Section VIII of the A.S.M.E. boiler code. Exchangers in steam service require careful consideration in the selection of the code. For example, exchangers such as preheaters and reboilers in which steam serves as the heat medium are often built to the A.P.I.-A.S.M.E. code.

Exchangers in which steam is generated as a byproduct of the main process are built to Section VIII of the A.S.M.E. boiler code. An example of this type of exchanger is a tar-to-steam generator. Exchangers in which steam is generated by heat from combustion of fuel are built to Section I of the A.S.M.E. power boiler code. An example of such an exchanger is a flue-gas steam generator.

Code comparison . . . The A.P.I.-A.S.M.E. code and the A.S.M.E. code, Section VIII, are now essentially in agreement on most points. The main difference is that the A.S.M.E. code requires spot examination of the welded joints by radiograph or trepan. Some other differences are in the design formulas for external pressures, in a few of the allowable stresses, and in the requirements for partial radiograph and stress relief. But in general, a vessel built to one code meets the requirements of the other one.

This material is from a paper, "Design Features in Heat Exchangers," by W. E. Glausser and J. A. Cortright, C. F. Braun & Co., Alhambra, Calif. Paper presented at annual meeting, A.S.M.E., New York.

Q. What should you watch in choosing materials of construction?

A. The proper selection of materials is important. There are four major factors to consider: corrosion, strength, cost, and fabrication problems. Normally the user is the one most familiar with his individual operations. He is in the best position to evaluate his corrosion problems. And he can best select the type of material or the corrosion allowance to meet his needs.

Types of materials . . . Many alloys are used in the fabrication of heat exchangers. Here are some of the conditions under which these alloys are used: for high pressures, a carbon-moly or carbon-silicon steel may prove more economic than carbon steel. The same may be true for moderately high temperatures, say up to 800° F. For higher temperatures, normally a chrome-moly steel is used. The stainless steels, 12-chrome and 18-8 chrome nickel, are used primarily for corrosion resistance.

Nonferrous alloys are often used in water service. They are monel, the various copper alloys, and occasionally aluminum. Choice of material is sometimes governed by availability. Most of the alloy plate, pipe, and tubes must be ordered directly from the mill. As a result, mill-minimum quantities and long delivery may influence the selection. Alloy forgings are more readily available.

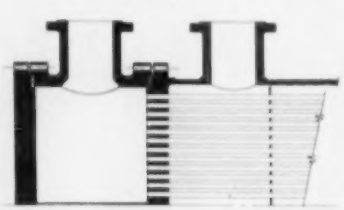


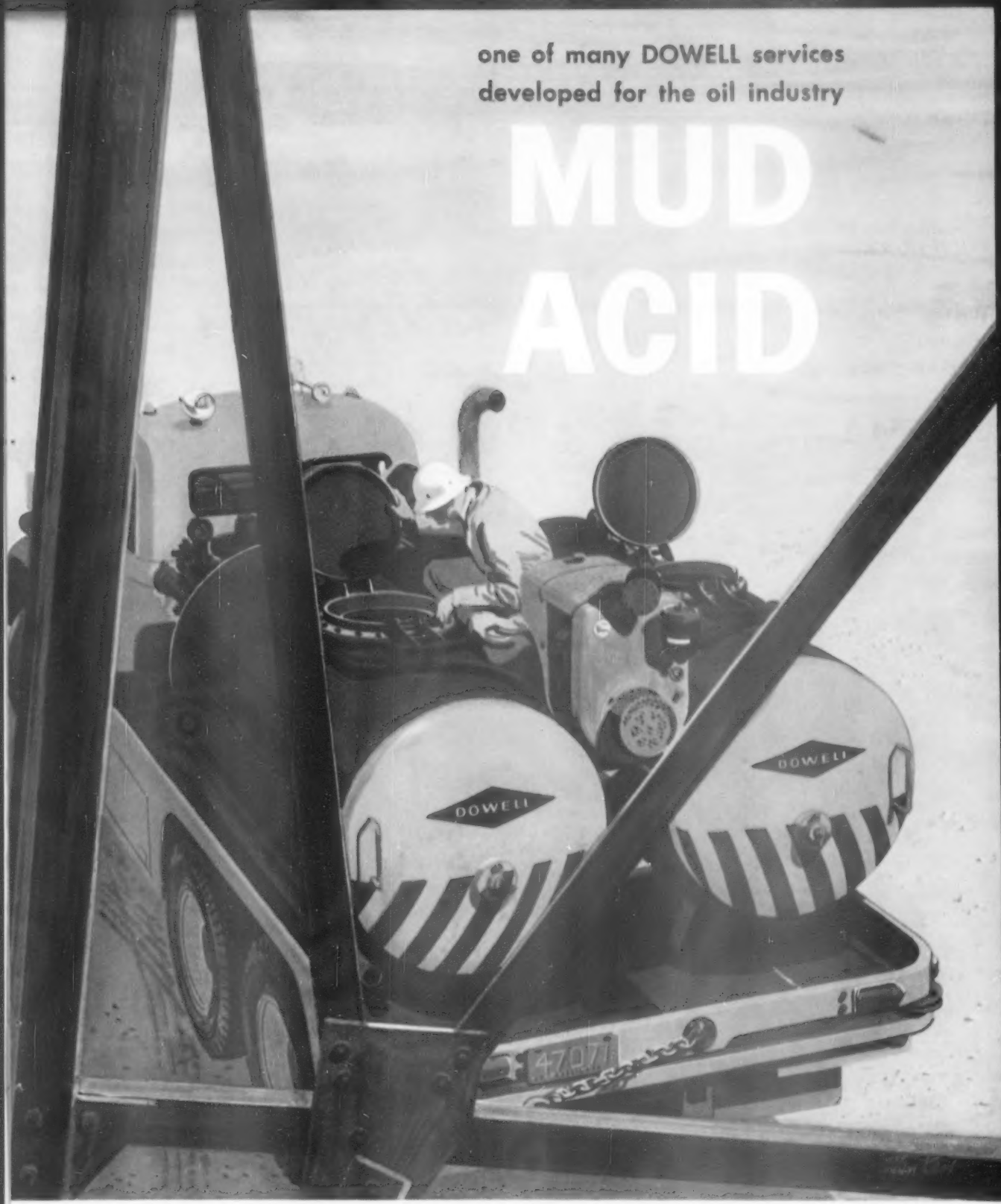
Fig. 8—Fixed-tube-sheet construction.

Q. What are the two basic types of shell-and-tube exchangers?

A. One has a removable tube bundle and is called a floating-head type. The other has a nonremovable tube bundle and is called a fixed-tube-sheet type. Here is a description of these two basic types with several of their modifications.

Fixed tube sheet . . . Fig. 8 shows a fixed-tube-sheet exchanger. This type of exchanger has no floating head or shell cover. The tube sheets are welded to the shell and the channels are bolted to the tube sheets. This type of construction has a low first cost. But the maintenance cost may be high because the shell side is inaccessible. The operating temperatures of fixed-tube-sheet exchangers are limited by the differential expansion between the tubes and the shell. Stresses induced by this expansion must be considered in the design computations. Sometimes an expansion joint is required in the shell to reduce or eliminate the expansion stresses.

Removable bundle . . . Fig. 1, Installment 1 shows floating-head exchangers. The removable bundle offers many operating and maintenance advantages. It expands independently of the shell. The bundle can be removed for inspection, cleaning, and repairs. A spare tube bundle will keep the unit operating if the original bundle needs extensive repairs. And floating-heat tube bundles can be made interchangeable between exchangers of the same size and type.



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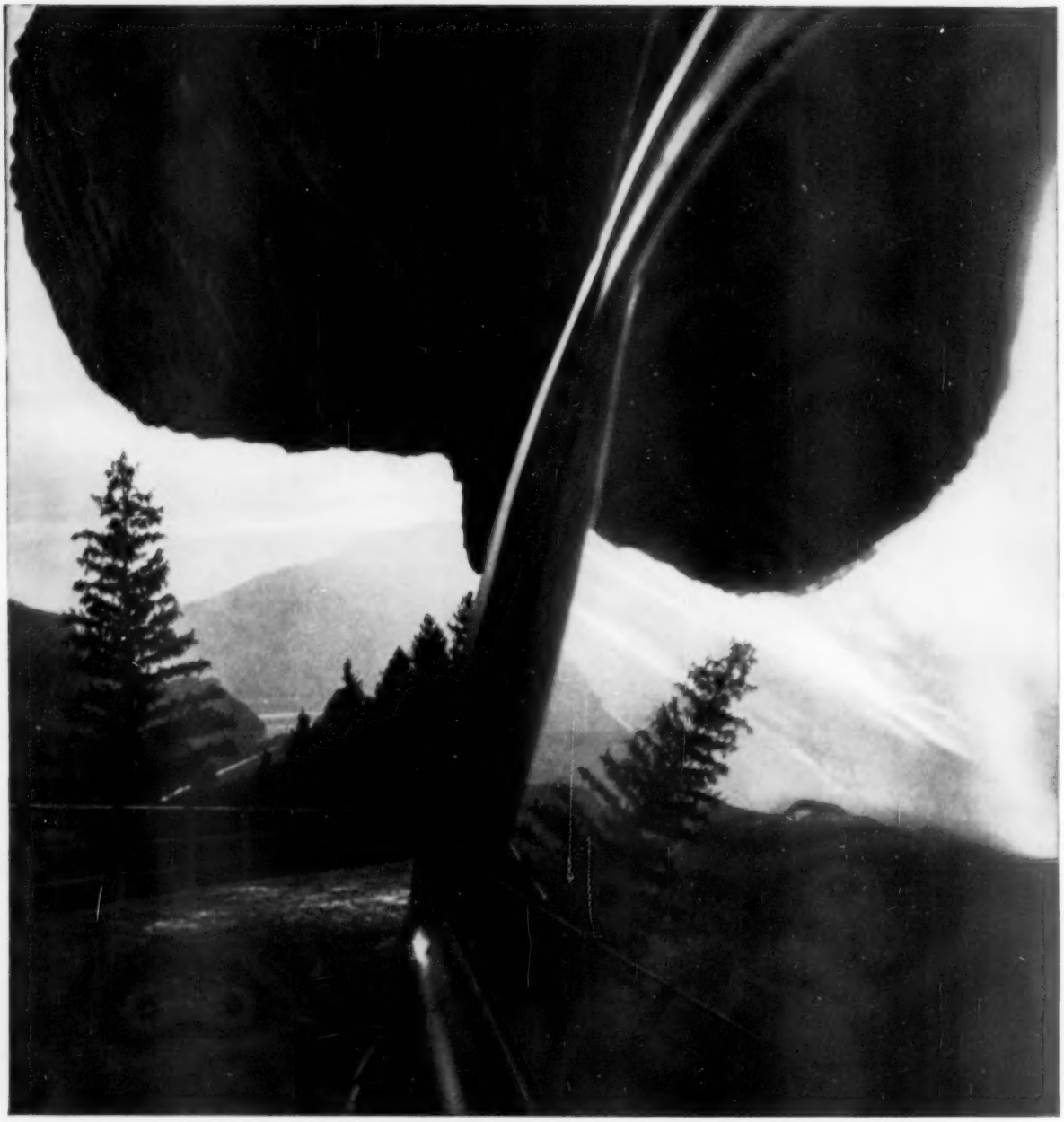


BP TOURS THE WORLD

AT THE HEIGHT of this summer season motorists in their millions are touring in their own country and abroad. You will come across them on Autobahns and in Alpine passes ; in places as far apart as Norway and Greece.

Wherever you may go in Western Europe or in many other parts of the world you are never far from the familiar sign of the green and yellow BP Shield where dependable service and quality BP motor products are always available.

The BP Shield is the symbol of the world-wide organisation of

The British Petroleum Company Limited

by W. L. Nelson
Technical Editor

COST-imating

Prices of Materials Rising Again

AN unusual number of price increases occurred during the months of November through February. Nineteen materials prices rose, some quite sharply, whereas only six small decreases occurred (and 16 remained stable). Meanwhile all labor items except skilled construction decreased slightly.

The Cost Indexes shown on this page may be used to convert prices known at any date to prices at other dates or the present, by ratios of the cost indexes of the same dates. Especially complete prices for the base year of 1946 are available in The Oil and Gas Journal reprint of the Cost-imating Series (October 21, 1948, through December 29, 1949). In addition most of the costs of the items on this page are being tabulated in special issues such as the one on the back of this page. A similar special issue was published in the last Cost-imating issue (April 11, 1955) and another special issue will be published on October 3, 1955.

Similar itemized Cost Indexes are published quarterly in the first weekly issues of January, April, and October. The Nelson Refinery Construction Index is published in the first issue each month of The Oil and Gas Journal in the Engineering Section.

Itemized Cost Indexes

(Multiply the 1946 prices of the Cost-imating Series by these Index Numbers divided by 100.)

	1948	1950	1952	1953	1954	Feb. 1955	References*	Index for earlier years (The Oil and Gas Journal unless noted) in Cost-imating issues
Labor:								
Skilled construction	125.0	140.0	157.9	167.3	174.6	177.1	Eng. News Record	No. 55—Nov. 3, 1949
Common labor	131.0	148.1	168.2	181.2	192.1	195.4	Eng. News Record	No. 55—Nov. 3, 1949
Refinery construction	128.0	144.0	163.1	174.2	183.3	186.2		No. 61—Dec. 15, 1949
Refinery operation	126.0	137.6	155.1	165.2	169.5	‡169.8	Sur. of Current Business	No. 55—Nov. 3, 1949
Equipment or materials:*								
Arc-welding machinery			151.3	154.7	158.4	163.9	Code 111-76	
Boilers, tanks, and sheet metal	†140.0	†136.0	†153.4	†150.3	147.3	146.5	Code 10-72	
Boiler tubes, 2-2¼ in.	131.3	149.5	168.8	188.3	199.4	202.7	Code 10-14-61	April 21, 1952‡
Building materials (nonmetallic)	120.6	127.0	134.8	140.7	143.6	144.6	Code 113	
Brick—building	122.8	132.5	140.6	142.8	144.7	147.4	Code 13-41	No. 22—Mar. 17, 1949
Brick—fireclay	133.3	153.4	167.1	181.8	193.1	199.0	Code 13-42	No. 20—Mar. 3, 1949
Castings (foundry products)	144.6	152.9	168.0	176.8	181.1	181.3	Code 10-15	
Clay products (structural, etc.)	121.3	134.6	145.8	153.1	159.1	162.6	Code 13-4	No. 46—Sept. 1, 1949
Concrete—ingredients	119.4	125.3	132.7	137.8	142.1	145.1	Code 13-2	No. 20—Mar. 3, 1949
Concrete—products	118.9	124.4	132.6	135.9	138.5	137.8	Code 13-3	No. 22—Mar. 17, 1949
Electrical machinery	127.6	134.9	152.4	156.4	159.9	160.7	Code 111-7	
Electrical motors and generators	128.6	135.0	154.6	157.1	157.7	155.0	Code 111-73	
Electrical switchgear			161.4	165.0	171.2	171.6	Code 111-75	No. 31—May 19, 1949
Electrical transformers, etc.	127.0	131.6	148.0	156.9	161.9	161.5	Code 111-74	
Engines (composite)	116.9	126.0	146.5	148.1	150.5	150.2	Code 111-54	No. 31—May 19, 1949
Exchangers	130.0	140.0	165.8	174.9	174.5	152.1	Manufacturer	No. 36—June 23, 1949
Fans and blowers	131.3	162.9	183.7	185.5	192.6	192.6	Code 11-47	No. 2—Oct. 28, 1948
Hand tools	125.2	143.2	155.1	165.4	173.8	180.1	Code 10-42	Feb. 17, 1949‡
Instruments (composite)	120.0	127.8	146.2	151.9	154.6	158.1	Manufacturer	
Flow meter (mechanical)		114.9	132.3	147.8	161.6	167.2	Manufacturer	No. 34—June 9, 1949
Flow meter (air control)		138.5	160.5	170.4	179.6	183.6	Manufacturer	No. 34—June 9, 1949
Flow meter (remote)		135.5	155.2	151.5	146.5	148.7	Manufacturer	No. 34—June 9, 1949
Potentiometer, 6-point		134.0	151.5	157.8	167.2	173.3	Manufacturer	No. 34—June 9, 1949
Potentiometer, air control		134.1	144.9	152.6	150.5	160.0	Manufacturer	No. 34—June 9, 1949
Pressure controller recorder		135.6	158.4	163.7	166.3	166.3	Manufacturer	No. 34—June 9, 1949
Pressure gage		101.2	108.6	108.6	108.6	108.6	Manufacturer	No. 34—June 9, 1949
Thermometer (recording)		124.0	149.4	152.6	152.8	153.2	Manufacturer	No. 34—June 9, 1949
Control valve		133.3	155.5	162.5	162.0	162.0	Manufacturer	No. 34—June 9, 1949
Insulation materials	126.8	125.0	130.4	133.5	135.5	131.9	Code 13-72	No. 34—June 9, 1949
Lumber (composite)	181.0	193.0	203.2	201.1	197.8	204.8	Code 8-1	
Lumber (Southern Pine)	174.3	176.9	191.2	189.6	181.2	188.1	Code 8-12	No. 7—Dec. 2, 1949
Lumber (other soft woods)	206.5	230.2	248.5	256.8	252.7	259.3	Code 8-13	No. 7—Dec. 2, 1949
Machinery—general purposes	124.9	136.7	151.8	155.1	159.9	161.7	Code 11-4	
Machinery—construction	127.8	140.1	157.5	162.3	165.9	168.2	Code 11-2	Feb. 17, 1949‡
Machinery—oil field	†125.9	†135.8	†149.9	†156.3	161.9	162.6	Code 11-51	
Paints—prepared	141.4	140.0	155.7	156.7	159.0	159.5	Code 6-21	
Pipe, sewer	110.9	120.7	136.9	136.1	140.1	143.1	Code 13-45	
Pumps, air compressors, etc.	127.0	138.2	155.6	162.5	166.5	167.0	Code 111-41	No. 22—Mar. 17, 1949
Steel (iron and steel)	141.1	152.9	168.5	177.4	179.6	183.5	Code 10-1	No. 29—May 5, 1949
Steel—finished steel	135.7	153.7	170.0	182.7	187.1	189.6	Code 10-14	No. 61—Dec. 15, 1949
Steel—plate and sheet		(See boilers, tanks, etc., above)						
Steel—structural shapes	145.0	162.7	176.2	185.7	193.4	196.6	Code 110-14-31	No. 18—Feb. 17, 1949
Valves and fittings	†125.9	†135.8	†190.8	193.1	197.1	199.3	Code 111-49 (1-6 & 11-14)	No. 46—Sept. 1, 1949
Nelson Refinery Construction	132.5	146.2	163.6	173.5	179.8	180.6		No. 61—Dec. 15, 1949

*Code refers to the revised index code number of the Bureau of Labor Statistics, U. S. Department of Labor, "Wholesale Prices." †Estimated base value for 1946. ‡Not exactly the same items as those published before July 7, 1952. §Questions on Technology, The Oil and Gas Journal. †Revised. ‡Preliminary.

by W. L. Nelson
Technical Editor

COST-imating

Prices of Basic Cost-imating Equipment and Materials—2

THIS list of the prices of equipments and materials that underlie the Itemized Cost Indexes of the Cost-imating Page was started in the April 11, 1955, issue of the Cost-imating Page. The items tabulated in the April 11 issue were:

Skilled labor
Common labor
Refinery construction labor
Refinery operating labor
Arc welding machinery
Boilers, tanks, and sheet metal
Boiler tubes
Building materials (nonmetallic)
Brick, building
Brick, fireclay
Castings, foundry
Clay products

The remaining prices will be published in the Cost-imating issue of October 3, 1955.

The purpose of the Itemized Cost Items of the Cost-imating Page is to make available at any time the wealth of price information that has been published (1) by the Bureau of Labor Statistics (over 872 prices each month), (2) in the 63 issues of the Cost-imating Series in The Oil and Gas Journal (October 28, 1929, through December 29, 1949) and its reprint, and (3) the long general literature on prices or costs. Prices at any date can be converted to current prices by ratios of the cost indexes, and if the price happens to be available during the year 1946, the current cost indexes can be used directly without computing a ratio (1946 = 100).

The list on this page follows the same general order as the cost indexes of the Quarterly Cost-imating Page (see preceding page). The list will be completed in the October 3 issue.

Prices of Materials Used in Cost-imating Indexes

(Arranged in nearly same order as on Quarterly Cost-imating Page)

Material or Equipment—	Bureau of Labor Code	Base price 1946	Price—Nov. 1954 Price	Index	Description
Concrete ingredients	13-20-00	(†)	.....	143.3	Composite, see following:
	13-20-01	*$0.744/ton	$1.148	*154.1	Sand construction
	13-20-11	$0.946/ton	$1.375	145.6	Gravel (for concrete) 1½-in. max.
	13-20-21	$1.08/ton	$1.549	*143.3	Crushed stone, 1½-in. max.
	13-20-31	$2.02/bbl.	$2.90	143.3	Cement, portland
Concrete products	13-30-00	.....	.....	138.4	Composite, see following:
	13-31-01	$0.156 ea.	$0.179	115.0	Block, heavy wt. aggregate 8 by 8 by 16 in.
	13-31-02	$0.137 ea.	$0.177	*129.0	Block, light wt. aggregate 8 by 8 by 16 in.
	13-32-01	$2.28/ft.	$3.646	*160.2	Pipe, culvert, reinforced, 24-in. dia., 4-ft. lgth.
Electrical machinery	11-70-00	(†)	.....	160.5	Composite.
Electrical motors and generators	11-73	(†)	.....	155.7	Composite of 15 items:
	.....	$278. ea.	*$432.00	*155.7	Motor, squirrel cage, 20-hp., Class 1 Group D explosionproof
	.....	$903.00 ea.	*$1,403.00	*155.7	Motor, squirrel cage, 75-hp., Class 1 Group D explosionproof
	.....	$2,210.00 ea.	*$3,280.00	*155.7	Motor, squirrel cage, 200-hp., Class 1 Group D explosionproof
Electrical switchgear	11-75	(No prices available		171.4	Composite of 20 items
Electrical transformers	11-74	(†)	.....	161.9	Composite of 5 items
	.....	$505.00 ea.	*$817.00	*161.9	Trans., single phase, 100 kva., oil immersed, self cooled
	.....	$1,080.00 ea.	*$1,750.00	*161.9	Trans., single phase, 250 kva., oil immersed, self cooled
	.....	$1,700.00 ea.	*$2,750.00	*161.9	Trans., single phase, 500 kva., oil immersed, self cooled
Engines	11-54	(†)	.....	150.0	Composite of 9 items
	.....	$10,400.00 ea.	$15,600.00	*150.0	Gas engine, 175 hp.
	.....	$38,200.00 ea.	$57,250.00	*150.0	Diesel engine, 700 hp.
Exchangers	.....	(†)	.....	‡166.4	Composite
	.....	$5,200.00 ea.	‡$9,676.00	‡186.0	Shell and tube, 32 in. o.d., 300 psi. adm. tubes
	.....	$3,570.00 ea.	‡$5,754.00	‡161.3	Shell and tube, 28 in. o.d., 300 psi., steel tubes
	.....	$192.00 ea.	‡$231.00	‡120.3	Double-pipe, 40-ft. unit, steel finished inner pipe
	.....	$274.00 ea.	‡$378.00	‡138.0	Double-pipe, 40-ft. unit, adm. finished inner pipe
Fans and blowers	11-47	(†)	.....	192.6	Composite of the two following:
	11-47-01	.....	.....	192.7	Cent. blower, SWSI, 48⅝ to 50⅜ in. wheel
	11-47-11	.....	.....	192.5	Propeller fan, 24-30 in. wheel, direct connected
Hand tools	10-42	.....	.....	178.9	Composite of 22 items, some as follows:
	10-42- 6	$1.393 ea	$2.70	194.0	Axe, single blade, 3½-4½ lb.
	10-42-16	$2.615 ea.	$4.167	159.1	Plane, jack, 14 in. long, 2-in. cutter
	10-42-21	$0.578 ea	$0.81	170.0	Chisel, wood, ¾ in. wide
	10-42-21	*$0.384/doz.	$0.632	*165.0	Wrench, open end, engineers ½ and ⅞ in. in. openings, Cr-Va
	10-42-32	*$0.444 ea.	$0.755	*170.0	Wrench, box, ½ and ⅞ in. openings, Cr-Va
	10-42-34	$1.20 ea.	$1.523	*126.8	Wrench, Stillson, 14 in. long
	10-42-41	*$0.266 ea.	$0.396	*149.3	Screw driver, 6 in.
	10-42-46	$9.022 ea.	$22.67	251.5	Vise, machinist's bench, stationary base
	10-42-56	$1.355 ea.	$1.99	147.0	Shovel, long handle, No. 2 round point
	10-42-61	$0.661 ea.	$1.612	244.0	Hammer, carpenter's, 1 lb.
	10-42-66	$0.648 ea.	$1.33	205.0	Hoe, field, 6¼-6½ in. wide, 4½-ft. handle
	10-42-71	*$0.974 ea.	$1.733	*178.0	Trowel, brick, 10 to 11 in. long
	10-42-76	$0.157 ea.	$0.346	220.0	File, flat bastard, 8-in.
	10-42-81	*$3.95/100	$7.04	*178.0	Hack saw blades, hard, 18-4-1 tungsten steel
	10-42-86	$3.80 ea	$6.33	166.5	Saw, crosscut, 6-ft., 2-man
	10-42-87	$2.20 ea.	$2.98	135.6	Saw, hand, 26-in.

*Approximate. Equivalent of index based on 1946, or price during 1946. †Refer to Cost-imating Series, The Oil and Gas Journal, Oct. 28, 1948, through Dec. 29, 1949, also reprinted. ‡October 1954 rather than November.

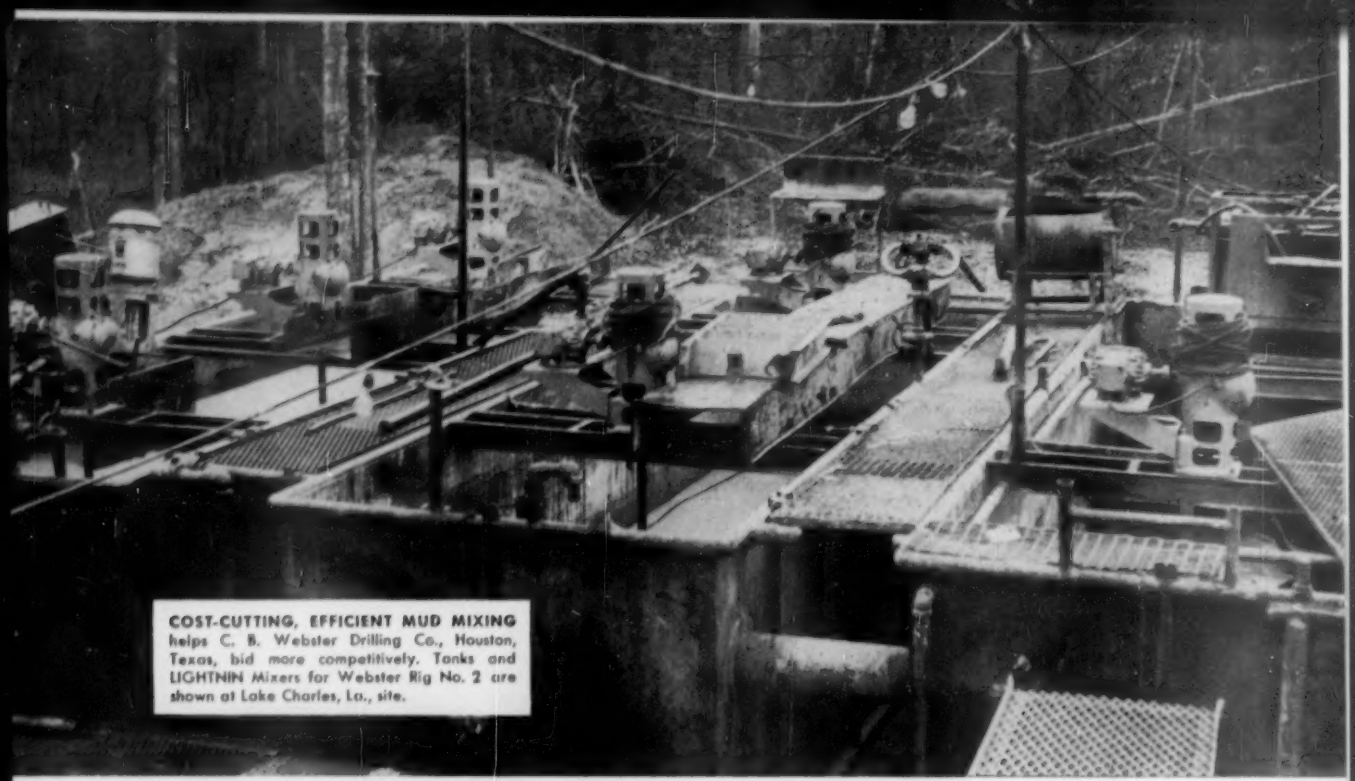
Wire Rope at Work—The intrepid derrickman whizzing through space in the picture above was photographed while demonstrating the safety slide. This device makes possible rapid escape from the mast in case of a blowout or other hazard. The rig shown here, which is owned by the J. W. McCutchen Drilling Company, Wichita Falls, was working at the time in Coke County, Texas.

The safety line consisted of Bethlehem 6x7 wire rope with a bethanized coating to guard against corrosion. Less spectacular in its application, but with far heavier duties, was the 6 x 19 Bethlehem rotary line, which of course saw active service hour after hour, day after day. Though installed for widely different purposes, both ropes were chosen for their known ability to do the work assigned to them, and do it well.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

PETROLEUM • MINING • CONSTRUCTION • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING



COST-CUTTING, EFFICIENT MUD MIXING helps C. B. Webster Drilling Co., Houston, Texas, bid more competitively. Tanks and LIGHTNIN Mixers for Webster Rig No. 2 are shown at Lake Charles, La., site.

How C. B. Webster keeps drilling costs low

This contractor drills deep holes with less mud . . . and passes savings on to customers

TAKE a tip from C. B. Webster, drilling contractor who found this new way to cut drilling costs.

He saves money on mud, by keeping his mud in top condition—always fluid, always ready—with LIGHTNIN Mud Mixers. And he avoids the cost of using a mud pump for tank circulation.

Here's the story, as Mr. Webster tells it:

"Recently we purchased six of your LIGHTNIN Mud Mixers and one LIGHTNIN Flash Mixer for installation on standard land tanks on our Rig No. 2, currently operating in the Lake Charles, La., area. And we are certainly pleased with their performance.

"As you may know, the mud bill for deep hole drilling, such as we are doing in Louisiana, is a pretty expensive item. Having LIGHTNIN Mixers on our mud tanks has helped cut down the mud bill. And cutting costs is the number one aim of every drilling contractor.

"Then, too, your mixers kept our mud ready at all times for any emergency, and saved us installing another mud pump on tank circulation.

"Adding LIGHTNIN equipment has helped us make savings that we can, in turn, pass on to the people for whom we are working.

"The Flash Mixer has given us top performance, too, when we have needed it. On mixing gels there has been no clogging, regardless of how fast we fed the material.

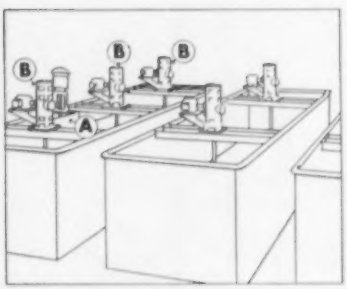
"We think the addition of LIGHTNIN Mixers to our rig equipment list will improve our position on future drilling bids.

"If any of your engineers would like to see our mud pit setup, we'll be more than happy to give permission for them to visit our rig on location."

See for yourself

Drilling men are using LIGHTNIN mud control on many rigs. You take no risk with LIGHTNIN Mud Mixers. Every LIGHTNIN is guaranteed to mix mud the way you want it mixed—faster than anything you've ever seen.

Get the facts firsthand. Ask your LIGHTNIN sales engineer to arrange a field trip to a rig in your area so you can see LIGHTNINs at work. You'll find his name listed in Composite Catalog—or just write, wire, or phone us direct.



UNIFORM MUD. Simplified drawing shows how Webster gets instant control of mud weight and viscosity. Weight and gel additions are dumped into the LIGHTNIN Flash Mixer well (A) by the sackful. The turbine-type LIGHTNIN Mud Mixers (B) equalize mud in a few seconds. Mixers keep mud flowing. It can't settle out. All the mud is ready for instant use. And Webster eliminates cost of replacing pump parts, valves, fittings worn out in mud agitation service. LIGHTNINs require virtually no maintenance.

SEND FOR this free 6-minute picture story. It shows how you get instant mud control and cut costs, too, with LIGHTNIN Mud Mixers.

"Lightnin® Mixers"

MIXING EQUIPMENT Co., Inc., 174-g Mt. Read Blvd., Rochester 11, N.Y.
In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 10, Ont.

Maintaining Slush-Pump Fluid Ends—3

WHEN installing new liners in slush pumps, be sure to clean the bore in the water cylinder and be certain that the tell-tale hole is open. If the surfaces contacting the packing are worn or washed, repairs should be made as soon as possible. Clean the liner both outside and in, and inspect it for any sign of physical damage. Oil both the liner and the cylinder, assemble the packing in accordance with the manufacturer's instructions, and insert the liner into the pump. It should fit very closely without forcing. Further instructions on assembly will be found in Section 6 on "Liner Packing," and Section 11 on "Cylinder Heads."

Removal . . . Use a liner puller which engages the inner end of the liner, particularly if the liner is to be reused. Do not "pump out" because this operation is hazardous to personnel and equipment.

Assuming that the liner is of proper design and quality, short service life is usually due to abrasive material in the mud, poor lubricating, tightening of the liner set screws, or operation with poor or worn pistons. A piston worn ⅛ in. on diameter, even if the bore is good, is no longer economical to run under severe conditions.

Piston failures should be detected and corrected at an early stage—if possible before the liner has been damaged. Such failures, when neglected, can even cut through the liner and into the cylinder bore. Danger signals are fluctuating pressure, the sound of fluid bypassing in the pump cylinder, and erratic stroking in the case of steam pumps.

Pistons

Pistons with the A.P.I. standard taper connection are commonly used. Operating pressures and mud content greatly affect piston life, so they should be selected on the basis of manufacturer's recommendations and the operator's experience.

Fit . . . To resist the extrusion type of failures described in Figs. 3a* and 5d*, it is necessary that the central flange or rib, which backs up the rubber elements, fits the liner accurately. It is also essential that the piston have a heavy hub with an accurately machined bore, so that it can be securely attached to the piston rod to avoid the type of failures described under "Piston Rods" and Figs. 6b and 6c.

Storage . . . Protect pistons from excessive heat, light, and oil. Purchase for current requirements to insure fresh stock, and leave them in the original packages until used. If they are unpacked, stack them so that the sealing lips will not be cut or distorted, because failure of the lip to contact the liner will probably cause an immediate failure.

Installation in pump . . . Do not install a new piston in a worn liner because this will result in a type of failure shown in Fig. 5d*. Note that wear does not extend to the ends of the liner, and measurements must be taken in the center portion. Lubricate the piston, preferably with graphite, to avoid damage during the starting period. Then insert it into the liner, being careful to avoid cutting or tearing the sealing lip. Where the pump will not fill by gravity, it should be primed through the valve cover openings. Neglecting to lubricate the piston on starting may result in a failure like Fig. 5c.*

Each piston design may cause a characteristic wear pattern in the ends of the liner bore. The use of a new-type piston in a worn liner may result in short life.

Factors affecting service life . . . Assuming that the piston is of proper design and quality, short service life is usually due to abrasive material in the mud (Fig. 5a*), operation in a scored liner (Fig. 5b*), mud with poor lubricating qualities or starting in a dry liner (Fig. 5c*), or to a poor bit causing extrusion and pinching (Fig. 5d*).

Selection . . . Piston rods with the A.P.I. standard tapered piston connection are commonly used. Suitable rods have a high-strength, ductile core and a deep, hard, abrasion-resisting case. Due to the severe loads imposed by the packing, it is essential that the hardening method used produce a case uniformly hardened over the entire surface, because as even a single soft spot may invite failure.

Where severe corrosion is encountered, it is usually economical to employ liners with a supplementary heavy-chrome plate over the hard case. The layer of chrome, being both corrosion and abrasion-resistant, gives considerable initial service in addition to the normal life of the hardened case.

*All figures referred to but not presented here were published in previous installments.

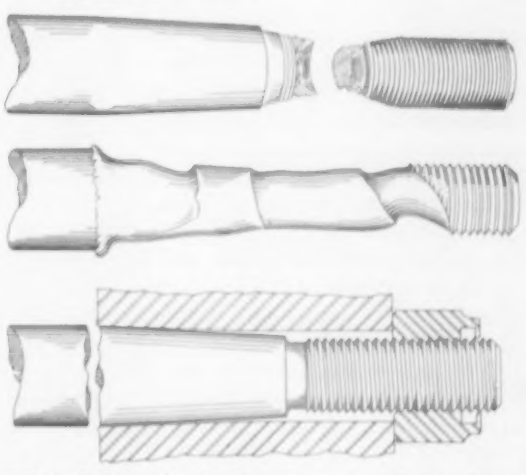
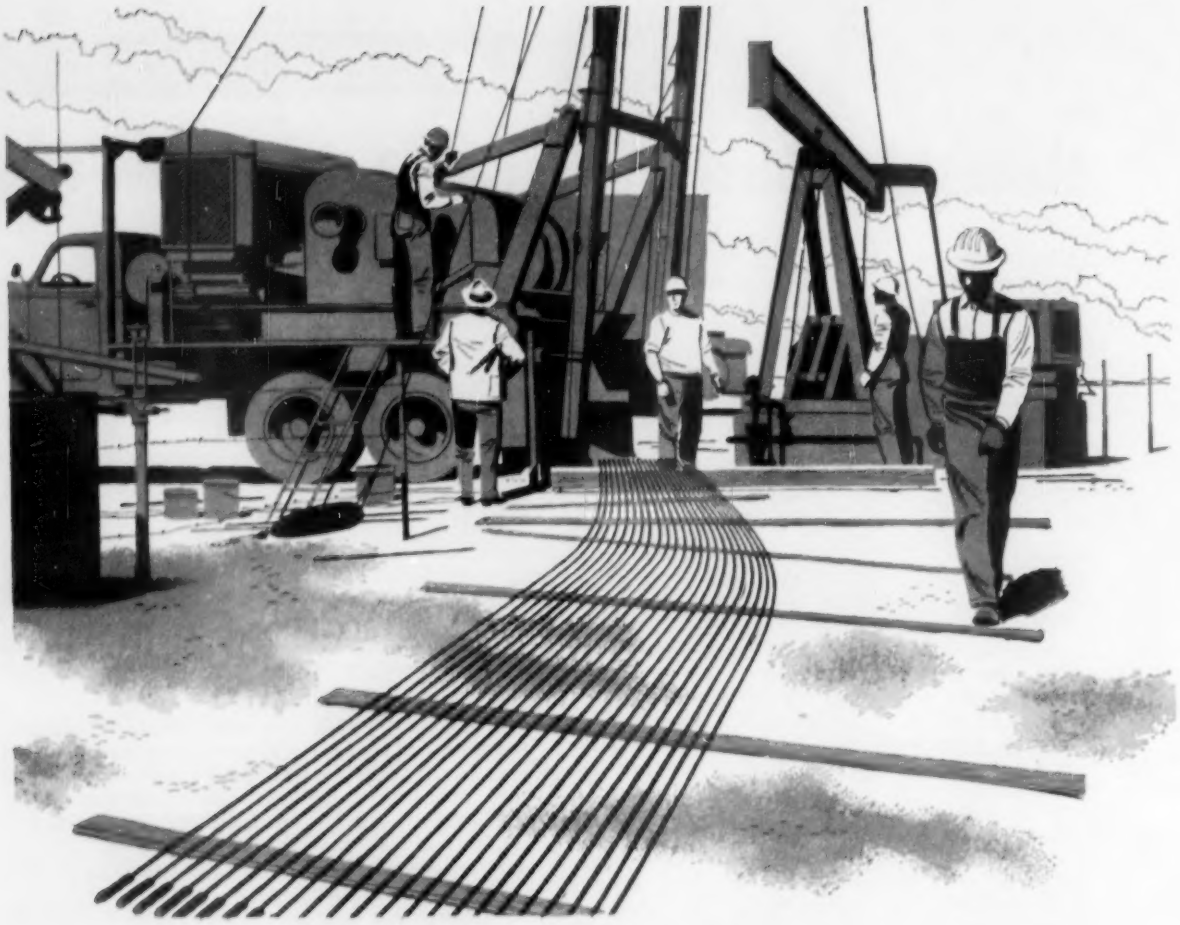


FIG. 6—Failures of rod-to-piston connection. Top (6-A), pure tension break; center (6-B), loosened and fluid-cut due to improper tightening; and bottom (6-C), failure due to sharp corner or poor fit.

This material taken from Tool Pusher's Manual, A.A.O.D.C. Originally prepared by J. V. Mahan, National Supply Co., Pittsburgh.



problem well pump—surfaced 3 times in 4 months—now in use over 2 years with Kennametal* Balls and Seats

When one of the edge wells on lease in this Houston field went from the flowing stage to recovery by rod, corrosive and abrasive conditions required pump surfacing as often as three times in only four months of operation.

Two years ago, Kennametal Balls and Seats were installed in this pump in a double valving combination. Recently, the pump was surfaced to remove the packed sand. Both balls and seats were found to be in excellent condition and were replaced in the pump. They are now operating as well as when they were originally installed.

This is the quality of service that users report and that you can expect from Kennametal sintered tungsten and titanium carbide Balls and Seats. They last from three to five times longer than any of today's "special alloys."

If you have a problem well, tell your pump service man to standardize on Kennametal Balls and Seats which are installed by repair shops of most major pump manufacturers. They will cost you less in the long run. For further information, contact your local supplier.

Kentanium* Balls provide excellent service in gassy wells, or where extreme conditions of corrosion and abrasion exist. Their light weight—⅓ lighter than steel—and extreme hardness minimize ball flutter, cage beating, fluid pounding and flour-sand cutting. Their high titanium carbide and nickel content assures excellent resistance to corrosion and electrolytic action. KENNAMETAL, INC., Latrobe, Pa.

*Registered trademark

INDUSTRY AND
KENNAMETAL
...Partners in Progress

Among the Drilling Contractors

New Firm Drills in Kansas

Dutch George Drilling, Inc., is a newly formed contracting and operating firm in Kansas. J. S. (Dutch) George, formerly vice president of Trans Era Petroleum, Inc., Wichita, is principal owner. Main office is in the Petroleum Building, Wichita. The firm's rig currently is on a wildcat test being drilled for M. B. Armer in southwestern Comanche County.

Hose-Austin Drilling Corp., Casper, Wyo., has moved a rotary rig into the Illinois basin area, and is operating in Gallatin and Saline counties, Illinois. Wayne Robbins, headquartering at Harrisburg, Ill., is drilling superintendent. Ray A. Hose and Fleming C. Austin, both of Casper, are president, and vice-president and general manager, respectively.

Arapahoe Drilling Co., Denver, has contracted for a 5,500-ft. Lakota test 3 miles northeast of Fish Creek, 35 miles southwest of Casper, in South Central Natrona County, Wyoming. The test, 2-C Government-Tysor, in 2-31-84w, will be drilled for Chicago Corp. and Republic Natural Gas Co.

Adkins Drilling Co., San Antonio, is scheduled for a 9,000-ft. wildcat test 4½ miles northeast of Slayden, and about 15 miles northwest of Gonzales, in northern Gonzales County, Southwest Texas. It will be drilled for Gulf Coast Leaseholds and Alfred C. Glassell, Jr., at 1 Johnson, in the Thomas Fowle Survey.

Rocket Opens Denver Office

Rocket Drilling Co., Inc., Wichita, Kans., has opened Rocky Mountain division offices at Denver. They are in Mile High Center. B. W. Burks, vice president, is division manager.

Frank Frawley Drilling Co., Tulsa, is under contract to Sunray Mid-Continent Oil Co. for a deep wildcat test in northern Lea County, New Mexico. Location is listed as 1-F State, in 1-10-33. It is 9 miles northeast of Mescalero field, nearest production. Drilling is set up to go to 12,600 ft.

Great Western Drilling Co., Midland, Tex., is drilling on a new wildcat venture 8 miles northeast of Monticello, in San Juan County, southeastern Utah. It is a contract job for White Canyon Uranium Co. The test, listed as 2 Sitton, in 20-33s-25e, is scheduled to go to the Paradox around 5,900 ft.

Montgomery Drilling Co., El Dorado, Ark., will be the contractor on the first of two wells R. E. King and Burton and associates, of Winnsboro, La., have scheduled for the Lamar area, in Franklin Parish, northeasteren Louisiana. Location is at 1 Baker es-

On the floor of a rig Burris Drilling Co., Wichita, Kans., has working on contract for Panhandle Eastern Gas Co. in the Hugoton gas area, in Morton County, southwestern Kansas. Left to right: Don W. Seago, engineer, Panhandle Drilling Mud Co.; W. E. Reed, drilling superintendent; Lloyd Acker and Gene Kreiger, floormen; Fred Meiers, derrickman; and M. A. Hill, driller.

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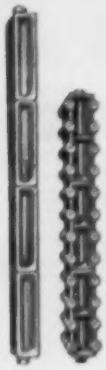

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tate, in 35-16n-9e. It is scheduled as a Tuscaloosa test with 5,200 ft. as the depth objective.

Power Rig Drilling Co., Lafayette, La., has a new contract operation scheduled for the Bosco area, in St. Landry Parish, South Louisiana. It will be a 10,500-ft. test for C. A. Lawrence, Jr., at 1 Savoie, in 26-8s-3e.

McMahon-Bullington Drilling Co., Wichita Falls, Tex., is working on a wildcat location 3 miles east of Gurley field, in Cheyenne County, southwestern Nebraska. The test is a joint operation for the contractor's own account and Don Christopher. It is carried as 1 Jorgens, with location in 9-15n-48w.

Central Drilling Co. is to drill a 5,300-ft. Grayburg test for Neville G. Penrose at a wildcat location, 1 Atlantic-State, in 6-19-36, about 5 miles west of the Eumont area, in Lea County, New Mexico.

Rheay & Reynolds Drilling Co., Abilene, Tex., is under contract to Allison & Prestridge for a 5,600-ft. Ellenburger test at a wildcat location 9 miles northeast of Aspermont, in Stonewall County, West Central Texas. Location, at 1 Pittcock, in 69-D-H&TC Survey, is 4 miles north of Boyd field.

Mac Drilling Co. is contractor on a 3,300-ft. wildcat test Producers Corp. of Nevada and associates are starting at 1 Rita Guerera, in the M. G. Frazier Survey, southeastern Live Oak County, South Texas.

Glasscock - Wilson, Inc., Shreveport, will drill a deep wildcat test for Aluminum Co. of America about 2½ miles south of production on Section 28 salt dome, in St. Martin Parish, coastal Louisiana. Listing is for 1 Marcolin Francis, in 18-10s-7e.

Clegg & Hunt, Houston, have a rig working for Cyprus Oil Co. on a deep wildcat test 7½ miles southwest of Kountz, in Hardin County, southeastern Texas. Location, at 1 French, in the Enoch Grigsby Survey, is 3 miles southwest of production in the Yonojosa area. Permit is for a 10,500-ft. test.

Rhodes & Hicks Drilling Corp., Alice, Tex., is set up for a 4,500-ft. wildcat test 5 miles southeast of Nordheim, in northern DeWitt County, South Texas. The test, 2 Pargmann, is Coastal Trend Oil & Gas Co.'s second in the area. The first, 1 Pargmann, was dry at 4,078 ft. Location is in the Antonio Lazo Survey.

Longhorn Drilling Co., Three Rivers, Tex., has a new contract job under way for W. B. Osborne in Lavaca Grant, 7 miles southwest of Alice, in Jim Wells County, Southwest Texas. Planned depth is 9,000 ft. The test is at 2 Carter.

Delta Gulf Drilling Co., Tyler, has taken a working interest in a 7,300-ft. wildcat test it will drill for Lyons, McCord & Logan 2 miles south of Hallsville, in Harrison County, East Texas. The test is listed as 1 Holloway. Location is 5 miles northwest of South Hallsville field.

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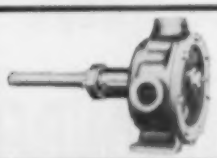
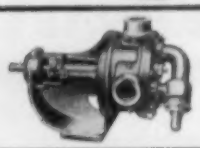
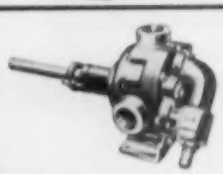
	Catalog	Service	Capacity	Maximum Pressure	Features
	Ask for Section Bt	General Purpose Pumps for Handling Liquids Ranging from Fuel Oil to Molasses	½ to 1050 G.P.M.	50 P.S.I. Non-Lubricating Liquids 100 P.S.I. Lubricating Liquids	Complete Range of Materials. Packed or Mechanical Seal. Jacketed Equipment.
	Ask for Section Ct	Heavy Duty Pumps Handle Both Thin and Very Viscous Liquids	10 to 300 G.P.M.	100 P.S.I. Non-Lubricating Liquids 200 P.S.I. Lubricating Liquids	Complete Range of Materials. Packed or Mechanical Seal Jacketed Equipment.
	Ask for Section Dt	Underwriters Pumps Handle All Types of Clean Hazardous Liquids	5 to 300 G.P.M.	50 P.S.I.	Standard Fitted Steel Fitted Bronze Fitted All Bronze Construction. Packed or Mechanical Seal.

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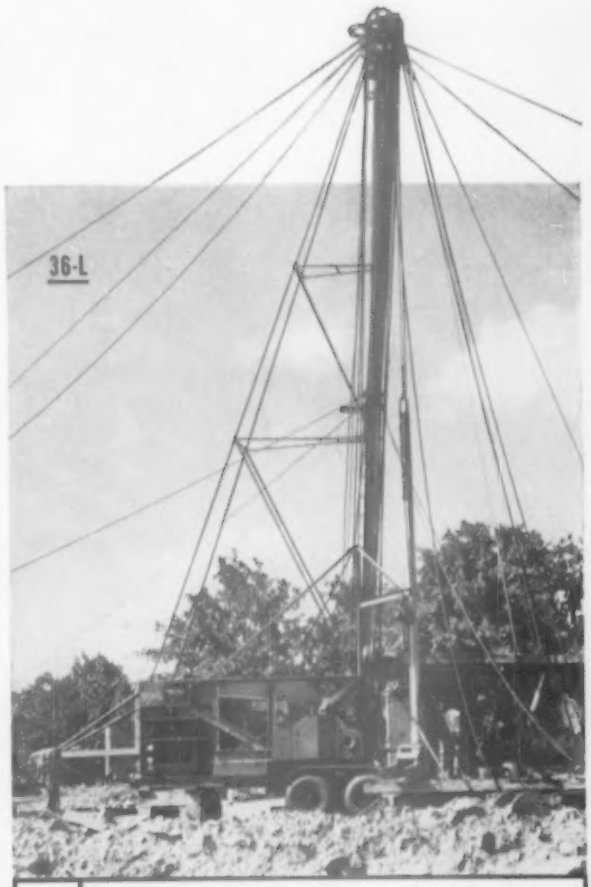

60-L	Top-to-bottom drilling to 1,500 ft.; Servicing to 2,000 ft.; Swings up to 2,750 lbs. of tools.
28-L	Top-to-bottom drilling to 2,500 ft.; Servicing to 3,000 ft.; Swings up to 3,000 lbs. of tools.
36-L	Top-to-bottom drilling to 3,500 ft.; Servicing to 4,000 ft.; Swings up to 4,200 lbs. of tools.
48-L	Top-to-bottom drilling to 6,000 ft.; Servicing to 7,000 ft.; Swings up to 6,000 lbs. of tools.

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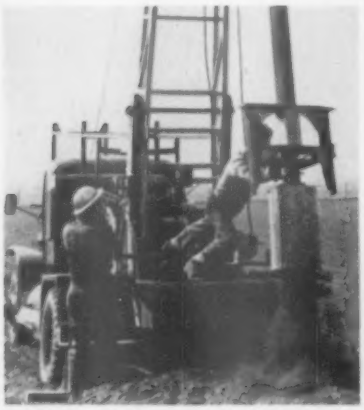

"MOUSE-HOLE" rig punched 40-45 ft. holes for anodes. Fig. 1.

PRE-ASSEMBLED ANODES were used on the job. Graphite rods centered in coke breeze fill and encased in sheet-steel cylinders made up the package. Fig. 2.

ANODE IS LOWERED into 40-ft. hole. Note rope was used to lower with instead of anode lead. Fig. 3.

CHAT BACKFILL will prevent possible gas blocking of the anode. The fill was well-tamped for good earth contact. Fig. 4.

Squeezed for space? Here's how Shell used deep anodes in . . .

Solving a limited right-of-way problem

by D. H. Stormont
West Coast Editor

ANODES placed some 40 ft. below ground level, rather than in the 10 to 12-ft. holes conventionally used, solved a narrow right-of-way problem for Shell Oil Co. when it undertook cathodic protection of pipelines interconnecting its Wilmington and Dominguez refineries.

The beds have not been installed long enough to prove their effectiveness in combating corrosion. But test results, discussed later, indicate distributed deep anodes have certain advantages over concentrated shallow-anode beds. Though fewer anodes are required, total installation costs are approximately 40 per cent higher.

The new-type system, completed early this year, covers 2 miles of a 5-mile span of 18 lines between the two refineries. A 1-mile section had been placed under cathodic protection in 1948, using the concentrated shallow-type bed. Because the limited right-of-way did not permit beds to be located at sufficient distance from the lines, the entire distance could not be protected—with standard shallow beds.

How it was done . . . A total of 51

holes, 40 to 45 ft. deep, were dug along the 12,000 ft. of right-of-way. Spaced at about 250 ft. intervals, the 18-in. holes were drilled with a portable "post-hole" rig (Fig. 1).

To aid installation of the anodes, prefabricated packages were used. These were 9-in.-diameter by 7-ft.-long cylinders of 30-gage black-iron sheet.

Standard 3-in. by 5-ft. graphite anodes were used. They were centered in the 7-ft. cylinder and surrounded with coal-coke breeze backfill. About 1 ft. of backfill was packed at either end. Wooden plugs, drilled to provide for breathing and for water drainage, were then inserted on either end as shown in Fig. 2.

Use of the packaged anodes assured they would be properly positioned in the hole, and that the proper amount of backfill would be above and below. After the packages were lowered to bottom (Fig. 3), dirt was water-tamped around them. Remainder of the hole then was filled with chat rock to prevent possible gas blocking (Fig. 4).

Experimental work . . . First experimental work with the deep-well anodes was in 1953. Two anodes were installed on the pipeline right-of-way near the Wilmington refinery. A year later, two others were used to study their effectiveness in protecting tank bottoms.

These tests were made in soils of 4,000 to 5,000 ohm-cm. specific resistivity to depths of about 4 ft. Their average specific resistivity at depths of 40 ft. ranged from 1,000 to 1,500 ohm-cm.

Results of these tests indicated that by using deep anodes the problem of mutual shielding of substructures in congested areas was greatly lowered. Thus better protective-current distribution was affected. Requirements for adequate protection (—0.85 volts pipe to $Cu/CuSO_4$) at the test locations were found to be 1 ma. per sq. ft. for tank bottoms. The same was the case for coated pipelines but those uncoated required 2 ma. per sq. ft.

They also indicated the use of deep anodes reduced the effect of cathodic interference in areas where there were other substructures not under protection. Still another indicated advantage was that the deep well anodes could be placed in layers of soil having lower resistance.

Over-all program . . . Cathodic protection work performed in 1949 at the Dominguez tank farm was the first large-scale protection of tank bottoms carried out at any Shell refinery.

From this first major installation, cathodic protection at the Los Angeles refineries has grown to 43 rectifier and anode-bed stations. These control soil corrosion on 90 per cent of the field-storage-tank bottoms, and on much of the underground lines in and between the refineries.

When the tank-bottom program was undertaken in 1949, it was found that a number of the 20 to 30-year-old bottoms were in such poor condition they would have had to be replaced in the near future. Many, however, are continuing to give satisfactory service under cathodic protection.

The 5-mile interrefinery pipe system now contains seven rectifier and anode-bed systems. Of these, four are the concentrated, near-surface type. The others are the new deep-well type on the 2-mile section.

The shallow anode beds have given highly satisfactory service. Two years before the first bed was installed in 1948, the 1-mile section it protects had

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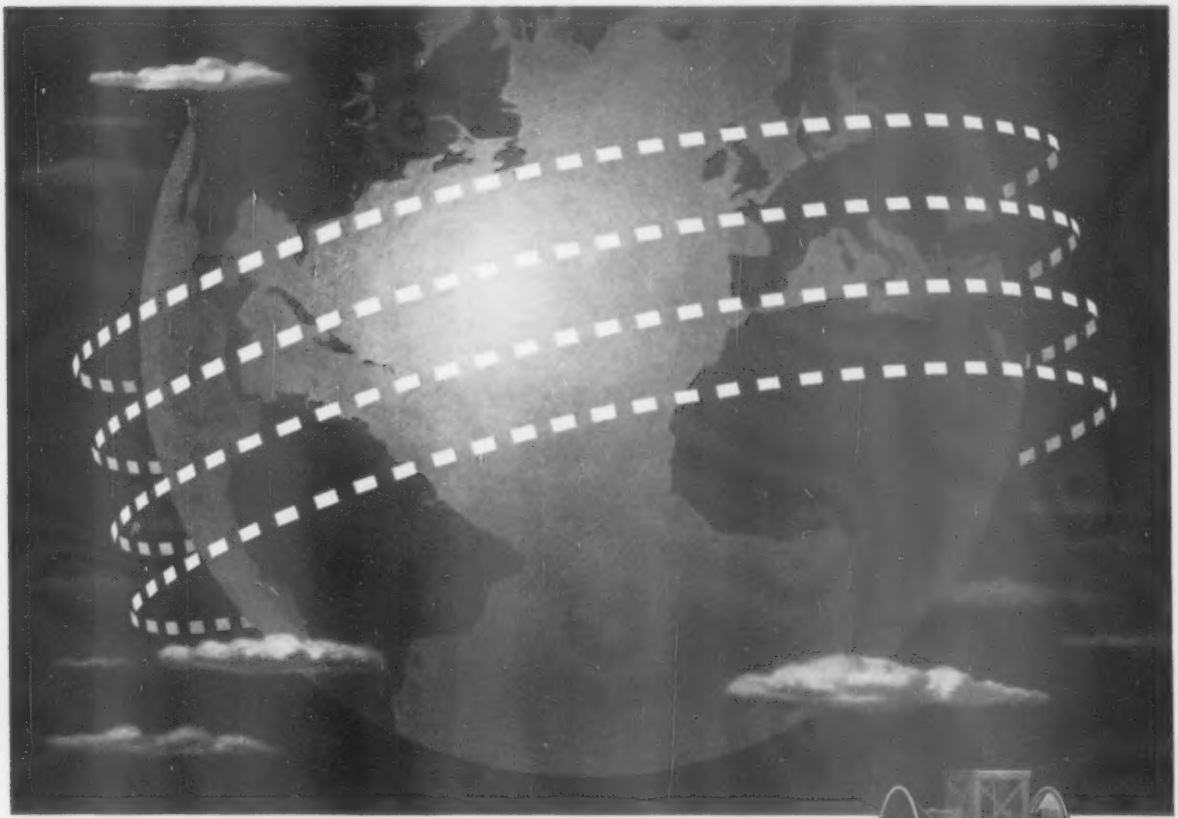

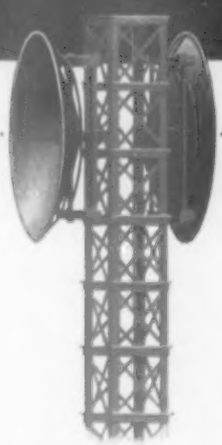

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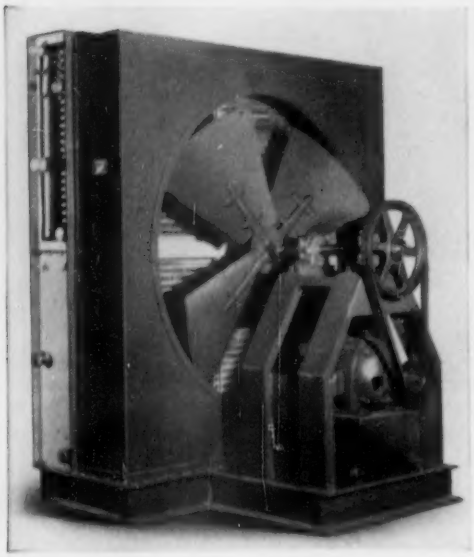

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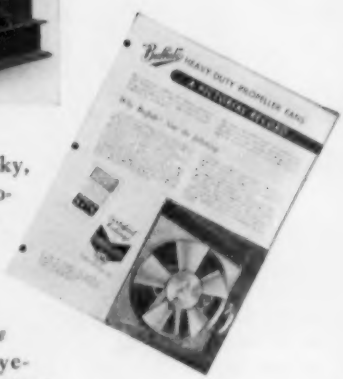

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five leaks. During the year before, nine more occurred. Subsequent to cathodic protection there was one leak during the first year. No more occurred until last year, when one leak developed.

Tips on maintaining ignition systems

by J. J. Wagner

TO get full service life from an ignition system, service and maintenance procedures as established by the manufacturer must be strictly followed. The following points apply to low-tension ignition systems used on large, slow-speed engines which pump oil or gas.

Let's consider one by one the individual components that make up a complete ignition system:

Spark plugs . . . Get in the habit of cleaning and gapping plugs at regular intervals. Failure to do so puts an extra load on the entire system.

Tighten the plugs properly in the cylinder heads and use a solid copper gasket between plug and head. This allows proper heat transfer and gives a good ground. In picking plugs for an engine, stick to the engine maker's recommendation.

Coil . . . Be sure a good ground exists between the transformer coil and its point of attachment to the engine. Keep the high-tension connections tight between coil and plug. Make sure the insulation on leads between magneto and coil has not deteriorated in any way. Use size 14 wire for this lead and have it no longer than necessary.

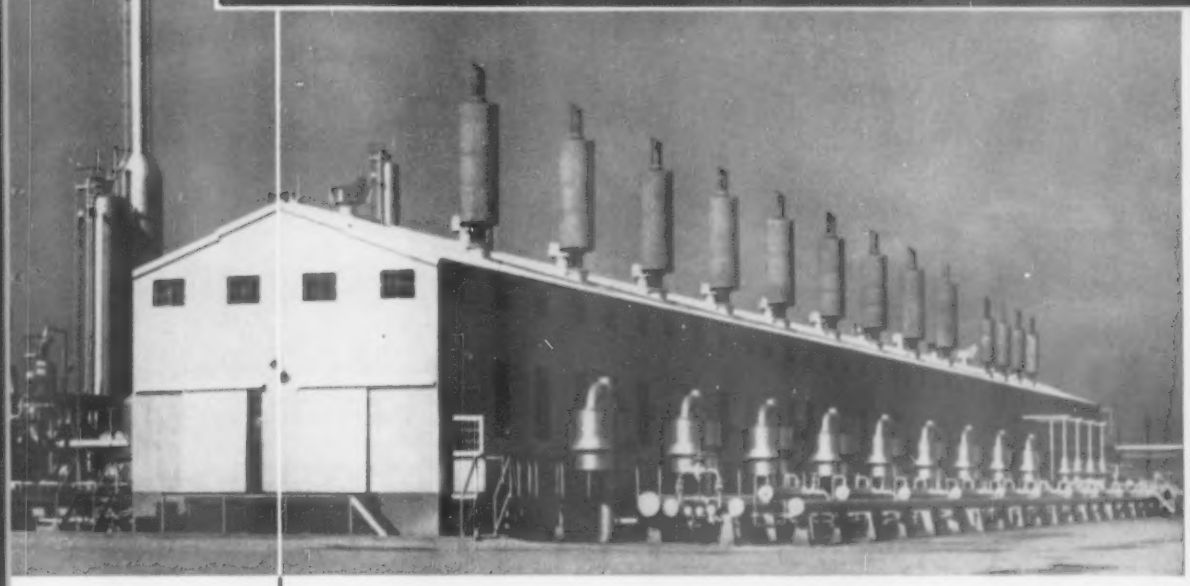
Magneto . . . Establish a good ground between the magneto and engine mounting flange. Remember that two circuits exist in any ignition system—the circuit through which current flows to the spark plug and the circuit which returns current to the magneto.

Keep the breaker compartment free of oil, grease, and grit. Never remove the breaker cover except for periodic checking of the breaker. Clean the breaker contact surfaces periodically by blotting with a hard-surfaced absorbent paper. Don't file the contacts in the magneto—take them out.

Take it easy with the oil can, using

Author is with Scintilla Division, Bendix Aviation Corp. Portion of paper given at the second annual meeting of the Gas Compressor Institute, University of Kansas, Liberal, Kans., May 2-3, 1955.

PARKERSBURG Steel Buildings



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Structurally, Parkersburg Steel Buildings provide maximum security for whatever they house. Their staunch steel framework —the interlocking side panels give them strength to withstand heavy snow loads and high winds.

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Because of the urgent need for gas, installation speed was of utmost importance. Permanence and strength, of course, were paramount considerations. To insure these factors, steel pipe and Bitumastic 70-B Enamel were selected. Machine cleaned, the pipe was given a coat of Bitumastic 70-B Primer. Then, Bitumastic 70-B was applied, to a thickness of 3/32 in. Finally, coal-tar saturated asbestos pipeline felt wrapper was applied to furnish a protective barrier against damage during handling and back-filling. All of these operations were performed over-the-ditch with a 38 to 44 foot section being run in, on the average, every two minutes.

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Pipeline Patrol

only a couple of drops of No. 60 oil on the cam follower felt. Maintain contact-point alignment and clearance. Use a 0.016-in. round wire feeler gage to check point clearance. Recheck point clearance 48 hours after installing a new set of breakers.

Make certain the distributor contacts for a particular cylinder close 15° before the main breaker opens. This lets current flow without interruption to the primary winding of the transformer coil—otherwise burning of the distributor contacts may result.

Drive . . . Be sure the impulse coupling is in proper working order and that magneto is properly lined up with the engine drive member. Check for misalignment by making certain that the drive disk is not binding on impulse coupling or engine drive lugs.

One more item. Should excessive breaker-point arcing and burning be encountered, check the condenser for correct capacity as recommended by the magneto maker. Also make certain that the series resistance is within allowable limits.

Follow these tips and watch your magneto-maintenance problems virtually disappear.

For more protection and greater safety . . .

HERE'S a pump station that uses the building wall as a firewall. The station is in the gathering system of National Cooperative Refining Co. in northwestern Kansas.

All pressure fittings are isolated from the engine by the firewall. Pump packing glands and bleed connection drains into the small station sump. This in turn is tied back into the pump suction.

With the engine inside, heat is supplied for the gager during winter and the engine itself is protected from the elements. With the high-pressure lines outside, no danger exists from fire in case of rupture or leakage.

They're getting good rod performance in the Village Field

Talk about trouble-free rod performance! Here's a well which, going into its fifth year of production, has pumped approximately 300,000 bbl of fluid from Smackover Lime, without rod failure. It's the Bond Unit No. 1, one of many Ashland Oil & Refining Company wells in the Village Field, Arkansas. The pumping unit is a Bethlehem 320D-TC29. Operating around the clock at sixteen 72-in. spm, it raises 20 bbl of oil and 350 bbl of water daily. The string consists of 2200 ft of ⅞ in., and 3300 ft of ¾ in. Bethlehem "46" Sucker Rods.

The Bethlehem "46" rod is made of nickel-molybdenum steel. It is fully normalized and tempered, and is ideal for economical pumping in virtually every type of corrosive service. It is regularly furnished with carburized hardened-and-ground A4615 steel couplings.

To make it easy for you to obtain maximum efficiency from your sucker rod strings, Bethlehem produces carbon and alloy rods in four other types in addition to the "46." Your distributor will be glad to advise you about the best rod for your type of pumping operation.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

UNIT PACKAGE SAVES TIME AND TROUBLE

Bethlehem Sucker Rods save time because they come in a unit package of 80 or 100 rods. Each rod is held firmly by spacer grooves, preventing contact with other rods. The package absorbs shock, thus protecting the rods from damage. Unloading can be accomplished quickly by means of crane and lifting rig.

BETHLEHEM *Sucker Rods* BETHLEHEM STEEL

New Increased Power
INTERNATIONAL TD-18A
Now with 103 Drawbar HP

LOOK AT THAT LOAD as operator applies 103-drawbar hp of new TD-18A. Steering is effortless with new hydraulic finger-tip controls and positive, self-energizing brakes.

NEW Power . . . New gearing . . . New ruggedness —for greater production

NEW Track Frames . . . 300 per cent stronger

NEW Finger-Tip Power Steering . . . advanced hydraulic design

NEW Operator Compartment . . . comfortable driver's seat—easy-to-reach controls

NEW Track Roller Oil Seals . . . 500-hour period between lubrications

NEW Positive Self-Energizing Brakes, 13% more effective brake area

NEW Appearance . . . sleek grille, heavy fenders, 75-gallon fuel tank. Better visibility . . . control-tower view front and rear

Here's the crawler tractor with everything contractors need to meet increased competition—increased work-power, increased ease of operation, increased durability:

The improved INTERNATIONAL TD-18A, now with 103-drawbar horsepower at 24,300 lbs. maximum drawbar pull in first gear at rated rpm.

Double check all these great new TD-18A features—right here on this page—on your job where you can take over the controls and appraise their value in extra work done for lower cost. Your INTERNATIONAL Industrial Power Distributor will arrange your own personal shake-down test of the TD-18A any time you say.

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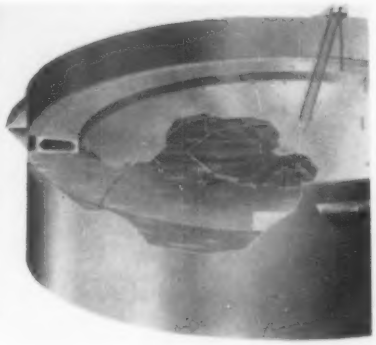
The OIL AND GAS JOURNAL

Showcase

OF NEW EQUIPMENT AND LITERATURE

by Dan B. Miller



Wyatt to Produce Three Types of Floating Roofs

Production of floating roofs in three new types is licensed under the Joor group of patents. In general these roofs are of the twin-deck, pontoon, and pan-type designs. The roofs are of a rigid design which permits only moderate deflections, thus assuring excellent drainage. There is no space beneath the deck where vapors may accumulate, thus lessening the possibility of corrosion of the deck plates.

The annular space between the roof perimeter and the tank shell is sealed at the oil surface by synthetic-rubber-asbestos-cloth sealing material. The sealing mechanism consists of long, heavy, galvanized-steel shoe plates, and a positive, mechanical-expanding mechanism forcing the shoes outward against the shell with uniform pressure over the entire area of the shoe. The design generally reduces evaporation losses at the edges of the roof and lessens the possibility of corrosion in the space housing the sealing mechanism.

There are no structures above the roof-deck plates. The roofs, therefore, are clear and maintenance costs are kept at a minimum. **For more information write or call: WYATT METAL & BOILER WORKS, P. O. Box 3052, Houston, Tex.**

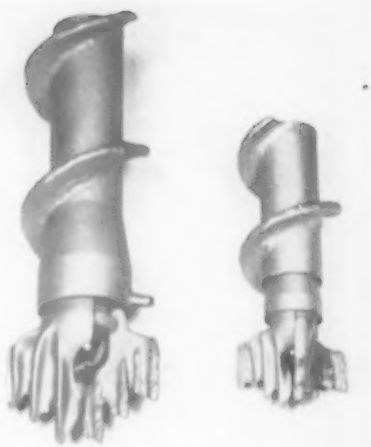
Auger Bit Designed With Replaceable Blades

A new replaceable-blade auger bit has been developed for drilling softer formations, particularly for the seismic-exploration industry.

The recommended auger assembly consists of a combination locking bowl and adapter sub threaded with a female tool-join-type connection to fit standard augers. The sub is fitted with auger flights properly located to coincide with the flights of the auger stem itself when connected.

Bit shanks are provided to accommodate an arrangement of either two or three rock-cutter blades. The two-blade assembly is more readily used in all auger-type formations because it readily permits the passage of cuttings up the auger flight. Use of three blades is suggested where hard stringers are encountered.

A steel ball is provided which seats inside the replaceable blades against the lower end of the bit shank. This permits the use of either fluid or air to assist in the lubrication and removal of cuttings, but prevents plugging of the circulation port by the cuttings. The new bit is available in Type "E," "DB," and "AC" adapter sizes, with blade sizes from 3½ through 6½ in. **For more information write or call: HERB J. HAWTHORNE, INC., 204 Cross Timbers, Houston, Tex.**



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The OIL AND GAS JOURNAL Showcase OF NEW EQUIPMENT

Permanent Valve Provides Advantages in Two Services

A new permanent valve provides improved operational advantages in two services. For artificial lift, the permanent valve serves as a pressure-charged gas-lift valve in which the operating pressure may be changed without pulling tubing. This permits the gas-lift installation to be designed so that the well may be unloaded with any available injection-gas pressure with freedom to change the injection pressure after the operating level has been reached. Thus, the most efficient lifting differential may be established without regard to the original spacing differential. As a flowing bottom-hole pressure regulator, the permanent valve holds any desired sand-face differential and provides a means of changing the differential through surface regulation of tubing pressure and the use of wire-line tools.

The permanent valve consists of a cylindrical pressure chamber closed at the upper end by a piston that is exposed to casing pressure on one end and to the chamber pressure on the other. The chamber encloses a full-bore tubing mandrel equipped with two sliding sleeve valves, the lower of which provides means of communication between the pressure chamber and the casing annulus.

The upper slide valve provides communication between the tubing and the casing, with the piston serving as the primary control. A predetermined pressure charge in the chamber acts upon the lower end of the piston and holds it in its upward or closed position until a greater pressure in the casing moves it downward. Upon the downward movement, ports in the piston align with similar ports in the upper slide valve, and injection gas or well fluid is allowed to enter the tubing. Whenever casing pressure falls below the pressure charge in the chamber, the piston again moves upward and closes off communication between the casing and tubing.

The operating pressure of the permanent valve is changed by opening the lower slide valve with a wire-line shifting tool. This exposes chamber to casing pressure. Then, when the slide valve is closed, whatever pressure existed in the casing is trapped in the chamber, and becomes the operating pressure of the valve. **For more information write or call: GARRETT OIL TOOLS, INC., P. O. Box 2427, Longview, Tex.**

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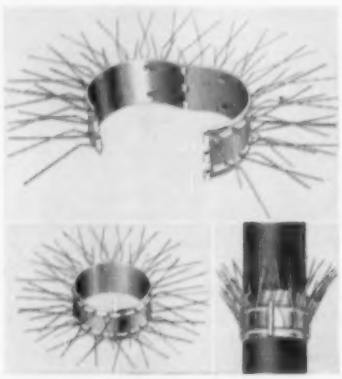


Wall Scratcher Available With Short or Long Wires

This new wall scratcher, furnished in either hinged or solid-ring design, features exceptionally strong and rugged construction to ensure maximum down-hole performance. In addition, an improved design and method of mounting the scratcher wires provide efficient removal of mud cake throughout the cementing area.

The wires of this scratcher become active and remove mud cake only when the casing is raised during the scratching cycle. While the casing is being lowered, the wires remain practically flat against the casing, and thus leave undisturbed the filter cake built up on sections of the hole other than the area to be cemented. In order to meet the requirements of all casing programs, scratcher wires are available in either 2½ or 4½-in. length.

The shell of the Model C wall scratcher is formed from two thicknesses of metal spot-welded together along the edges. This construction provides increased strength not only because of the additional thickness of the shell, but also because of the resulting beam effect.

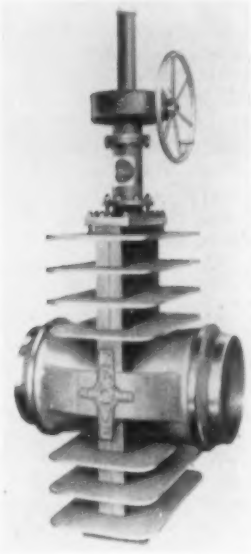
The Hinge-Lok scratcher now has a stronger hinge construction and a new, heavier closing pin. The pin is knurled for a distance of about ½-in. downward from its head. This knurled section bites into the inner surface of the hinge as the pin is installed and prevents loosening by vibration. **For more information write or call: BAKER OIL TOOLS, INC., Box 2274, Terminal Annex, Los Angeles 54, Calif.**

●

36-In. O-Ring Gate Valves Now Available

Seal-"O"-Ring gate valves up to 36 in. for all petroleum and gas pipeline pressures have been made available through the development of a new fabricated-steel body design.

Full opening or venturi types are available with flanged or welding ends. The through-conduit fabricated-valve body is also said to provide maximum design flexibility for special applications. Standard models are listed from 2-in. to 36-in. sizes in A.S.A. Series 150, 300, 400, and 600.

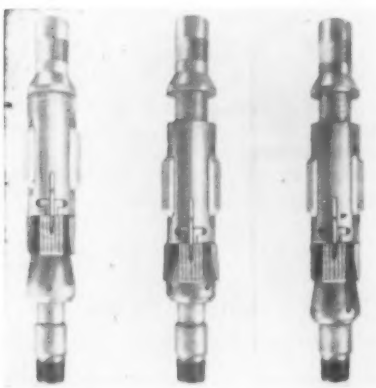


Utilizing a parallel-sided port plate with self-aligning metal seats backed up by O-ring seals, the units maintain absolute bubble-tight seal on both upstream and downstream seats. The body may be vented or drained to provide positive indication of absolute shutoff. **For more information write or call: GROVE VALVE & REGULATOR CO., 6529 Hollis Street, Oakland 8, Calif.**

New Anchor Prevents Pump Reciprocation

This new tension-type tubing anchor was designed to hold the tubing of a pumping well in tension to prevent reciprocation of the pump. This reduces lost motion in the pumping stroke and eliminates tubing-collar and casing wear.

The anchor is strictly mechanical in function, with positive setting regardless of fluid levels or pressure differentials. It contains two means of release when it is desired to remove the tubing from the well. It may be located in the tubing string near the working barrel of the pump, either above or below.



The anchor is prepared for running in with the automatic latch at top made up and slips retracted.

After running anchor to the desired setting and spacing out below the tubing head, the tubing is rotated to the right about 9 to 12 turns while picking up about 2 to 3-in. It then continues to pick up tubing and, when the landing position is reached, the slips are engaged. The tubing is then picked up a little more to install the tubing head packoff, lowered into the tubing head, and flanged up in the christmas tree. This procedure is reversed to release the anchor for removal of the tubing. **For more information write or call: TEXAS IRON WORKS, 1423 Maury Street, Houston 10, Tex.**

●

Kylo 27 Reduces Water Loss In Most Drilling Fluids

Kylo-brand water-loss additive No. 27, manufactured from petroleum gases and designed specifically for conditioning oil-well drilling fluids, is now available in dry, free-flowing flake form. The product in this form is easier to handle, requires less storage space, and sells at lower cost per pound of active solids than the solution form.

Kylo 27 effectively controls water loss in practically all types of drilling fluids. In addition, it apparently helps reduce or eliminate such hole troubles as sloughing or caving by aiding in the formation of a thinner and tougher-than-usual filter cake on the sides of the hole. The product is not subject to measurable degradation by heat or bacteria under conditions likely to be encountered in an oil well.

Field use has indicated that as little as 0.3 to 0.5 lb. of Kylo 27 per barrel of mud generally produces a marked reduction in water loss without undue effect on the viscosity or gel strength of the fluid. Heat and bacteria normally encountered have not measurably degraded Kylo 27 under field conditions. Under practical operating conditions in several western states, Kylo 27 has produced excellent mud properties in widely different types of drilling muds. Properly used, it appears to be compatible with conventional mud-treating chemicals in any of the commercially important types of drilling fluids. **For more information write or call: MINNESOTA MINING & MANUFACTURING CO., 900 Fauquier Street, St. Paul 6, Minn.**

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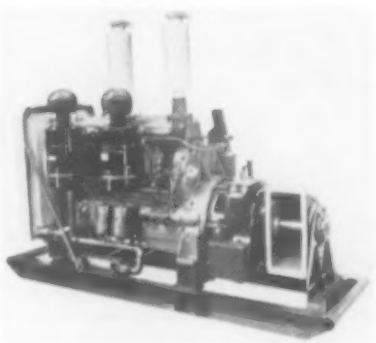

Torque-Converter Added To Diesel Engine Line

A line of diesel-engine torque-converter power units built around the two-cycle diesel engine, provides smooth, steady power over the full speed range. The torque-converter has an unusual cushioning effect which entirely eliminates shock loads from driven equipment, resulting in better performance and longer life. A very wide range of speeds may be obtained.

The torque-converter is complete with its own fluid cooler. Various types of clutch arrangements may be had. A tail-shaft governor is available to control the output shaft speed.

This unit is offered on a complete line of diesels, from two to six cylinders, 30 to 255 hp. **For more information write or call: Diesel Engine Division, HARNISCHFEGER CORP., Main Street, Crystal Lake, Ill.**

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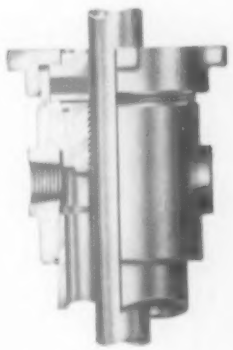


Jeep Tubing Head Features Weld-Free Construction

The Jeep tubing head is designed for safe and economical completion of low-pressure wells.

Featuring a flexibility in accordance with the latest completion, repressuring, fracturing and production practices, the Jeep is the only forged-steel head in its class completely free of welds in construction.

Designed for 1,000 lb. c.w.p., 2,000 lb. test, the Jeep assures a positive seal by means of a double packer, and carries three-piece hinged slips. It is available in 4½ and 5½-in. female full opening and 7-in. male not full opening for 2 or 2½-in. tubing, and with two 2-in. threaded outlets. **For more information write or call: GULF COAST MACHINE & SUPPLY CO., P. O. Drawer 1150, Phone 2-8481, Beaumont, Tex.**

●

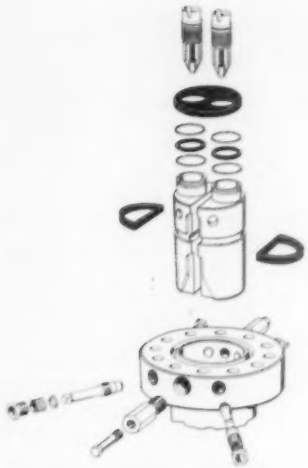
Dual-String Christmas Tree Assures Positive Control

A new dual-string christmas tree assures positive control during all completion operations. The new DC completion tree allows the operator to run parallel strings in precisely the same

manner as single strings, independently or simultaneously, and with the protection of the closed-pressure system of well completion.

At no time during completion operations does the DC equipment leave the well open. A standard QRC blowout preventer with special off-center rams provides complete protection during the initial phase of the completion. Back-pressure valves are provided to safeguard against loss of control through the tubing string.

Each tubing string is suspended, securely in the tubing head, and sealed before preventers are removed. The tree may then be installed and flow-line connections made before removing the back-pressure valves and washing the well into production. Two strings of 2⅜-in.-o.d. upset tubing may be run in 7-in. casing with 6-in. heads. **For more information write or call: CAMERON IRON WORKS, INC., P. O. Box 1212, Houston 1, Tex.**



•

Unicor Extended to Use In Product Pipelines

A new corrosion inhibitor has been extended to product pipelines. The broadening of Unicor's application from petroleum-refinery process equipment to include pipeline protection has been made possible because of the new inhibitor's double-action qualities.

Tests have shown that Unicor protects pipelines and storage equipment from ordinary rusting caused by moisture and air. It also protects steel and admiralty equipment from acid and ammoniacal attack in refinery units under anaerobic conditions.

Operators of pipelines will find the use of Unicor economical because of its bifunctional characteristics and high potency at low concentrations. Laboratory studies indicate that a typical application of Unicor for refined gasoline would consist of 5 to 10 p.p.m. Even in this quantity, Unicor has been found to be highly effective as a detergent, thus sharply reducing mechanical cleaning maintenance.

Unicor is readily soluble in product streams and not extractable by water. It is compatible with all commonly used gasoline additives, leaves no ash deposits, and will not harm the stability of gasoline and other highly upgraded petroleum products. **For more information write or call: UNIVERSAL OIL PRODUCTS CO., 30 Algonquin Road, Des Plaines, Ill.**

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Need service fast? With five main outlets in Oklahoma, Dewey Supply Company can now offer fast deliveries around the clock. Just pick the store most conveniently located to your operation, or call the main office in Tulsa for complete information.

Dewey Supply Company handles a full line of equipment for all major oil operations, and will offer a complete credit plan to meet the needs of each individual buyer.

Remember, for fast delivery and excellent service, you can depend on Dewey Supply.

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LARKIN HEADS for medium pressure wells

LARKIN
TYPE "L"
TUBING HEAD

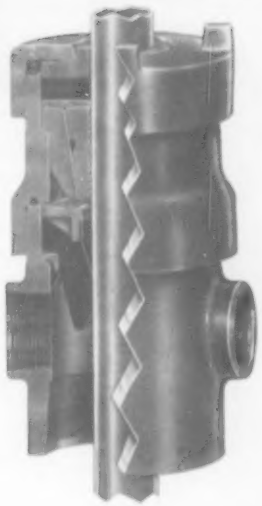
The Larkin Type "L" Tubing Head . . . a comparatively new member of the Larkin Well Head Line . . . fills a need in low pressure areas where economy may be effected with complete safety.

Larkin Type "L" Tubing Head Features:

1. Forged steel construction
2. 2000 p.s.i. test
3. Full opening
4. 2" or 3" side outlets
5. Top of body threaded 7" API to accommodate control equipment
6. Hinged three-segment slips
7. Hammer-up lugs and bar holes for ease in make-up
8. Parts for 5½" and 7" sizes are interchangeable.

Also illustrated are the well-known, dependable Larkin Type "SR" and Type "R" 4000 p.s.i. test Tubing Heads which are so widely used in medium pressure fields.

For detailed information on these and other Larkin Tubing and Casing Heads, please refer to your Larkin Catalog or discuss them with your nearby Larkin Representative. All Larkin equipment is available through your supply store.


LARKIN
TYPE "SR"
TUBING HEAD

LARKIN
TYPE "R"
TUBING HEAD

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The OIL AND GAS JOURNAL Showcase

- BULLETINS
- CATALOGS
- BROCHURES

Microwave building block units which can be easily assembled in various combinations to provide numerous communications functions are described in a new series of catalog pages, C.5461 to C.5465, just issued. Each unit is described in detail and complete specifications are provided. **For more information write or call: Communications Equipment, Engineering Products Division, RADIO CORP. OF AMERICA, Camden 2, N. J.**

●

The Story of a Revolution in Fluid Storage. Huge collapsible storage tanks for storing bulk liquids as an emergency or temporary measure are now in production for industrial use. The pillow-type tanks, originally developed for military use, are constructed of two layers of fabric reinforced synthetic rubber, vulcanized into a single unit. A 12-page illustrated brochure which gives complete information on the construction, applications, and advantages of the tanks can be obtained. **For more information write or call: Aviation Products Division, GOODYEAR TIRE & RUBBER CO., 1144 E. Market Street, Akron 16, Ohio.**

●

Complete Line of Gas Testing Equipment. A complete line of gas testing equipment, including bell provers, flow provers, test meters, and flow-indicating meters, is described in a completely revised version of bulletin No. 1066-5. The new bulletin includes detailed factory recommendations for proving meters at different rates of flow. Also described are test meters, which are large-dial modifications of new standard aluminum domestic and commercial meters. **For more information write or call: Meter and Valve Division, ROCKWELL MANUFACTURING CO., 400 North Lexington Avenue, Pittsburgh 8, Pa.**

●

A Bigger, Air-Cooled, Packaged Compressor. A 125-hp. electric-driven air compressor has been added to the line of air-cooled, two-stage, Type 40 stationary compressors. The new size is expected to fulfill the need of contractors and industries for a lightweight compressor of this size that can easily be moved from job to job. Some of the new features of this unit are: single-core, horizontal-flow intercooler, new shrouding, force-feed lubrication, full free-air unloading, and a new version of the channel valve. A four-page flier, Form 3188, completely describes the new unit. **For more information write or call: INGERSOLL-RAND CO., 11 Broadway, New York 4, N. Y.**

●

LQ600 Valve. A comprehensive, completely illustrated, four-page circular describes the new LQ600 valve, a first bronze globe valve with Brinalloy seats and disks. The valve is remarkably resistant to wear and corrosion. New seat-and-disk alloy (Brinalloy) outlasts case-hardened stainless steel exceeding 1000 Brinell and has eliminated the need for maintenance, renewal, repair, or replacement in more than 100 test installations for periods up to 4 years. **For more information write or call: LUNKENHEIMER CO., Box 360, Cincinnati 14, Ohio.**

●

Schutte & Koerting Valves. A new bulletin V-1 is designed to show engineers, in the briefest possible way, some of the current valve types. The bulletin illustrates and describes SK's line of bleeder-check, boiler-feedwater, venturi-reducing, heater-bypass, balanced-butterfly, and atmospheric relief valves and a new high-pressure forged strainer. **For more information write or call: SCHUTTE & KOERTING CO., Dept. V-B, Cornwells Heights, Bucks County, Pennsylvania.**

●

Package Boilers. A 12-page booklet on package steam generators, a compilation of articles of interest to plant operators and engineers, describes the formulas behind all package steam generators, and illustrates how installation of a package steam generator can raise steam capacity in any existing boiler room without extensive structural changes. **For more information write or call: Cyclotherm Division National —U. S. RADIATOR CORPORATION, Oswego 3, N. Y.**

●

Expanded Stock Instrument Program. Process-control instruments standardized and stocked for immediate shipment are described in the new 24-page Catalog 2. Complete specifications include dimensions, prices, capacities, and construction materials of (1) master-enclosed Flowrator meters, (2) tri-flat low-flow-rate meters, (3) all-glass flow

meters, (4) master-enclosed-type flow indicators, (5) armored flow meters with various indicating and transmitting extensions, (6) pneumatic recorders and controllers, (7) flow-test kits, (8) orifice-type flow meters, (9) purge meters, (10) pressure regulators, (11) differential-pressure regulators, (12) sight-flow indicators, (13) flow-rate gages, (14) flow-rate indicators, (15) chemical feeders, (16) chlorinators, (17) miniature pneumatic indicators for graphic panels, (18) self-operated flow regulators, and (19) specific-gravity testers. **For more information write or call: FISCHER & PORTER CO., 397 Jacksonville Road, phone OSborne 5-600, Hatboro, Pa.**

●

Rigid PVC Pressure-Rated Plastic Pipe Solves Corrosion Problems For Oil Producers. Showing how and where lightwall, new line of high-impact, pressure-rated, oil-country pipe is used to combat corrosion, is the subject of a new folder. To help drilling and producing superintendents, foremen, drillers, and production engineers, the folder shows how maintenance problems can be minimized in the handling of sour crudes and salt water with use of rigid, PVC pressure-rated plastic pipe. The folder gives full data on uses and applications of Alpha No. 103 rigid PVC pipe for transmission, gas, gathering, lead lines, and chemical lines. **For more information write or call: ALPHA PLASTICS, INC., 14 Northfield Road, West Orange, N. J.**

●

Electroforged Steel and Interlocked Aluminum Grating. A new grating catalog, bulletin No. 2486, describes the types, sizes, and load characteristics of the complete line of electroforged steel and interlocked aluminum grating. **For more information write or call: Grating Department, Equipment Division, BLAW-KNOX CO., Farmers Bank Building, Pittsburgh 38, Pa.**

●

Pye Telecommunications News Letter. Issued monthly, this bulletin covers many installation and operational stories of radio-telephone equipment being used in industry throughout the world. **For more information write or call: PYE, LTD., Telecommunications Division, Cambridge, England.**

●

G-R G-Fin Tubing. Engineers and operating executives of plants in which fluids are being heated, cooled, or condensed by other fluids with different heat transfer characteristics will be interested in a new bulletin on finned tubing. The tubing described in this bulletin is the G-R G-Fin tube with longitudinal fins, having six to eight times the exterior surface of the same length of bare tubes. When used for heat transfer between two fluids of dissimilar heat transfer rates, these finned tubes permit the use of heat exchangers that are smaller in size, weight, and space than units with bare tubes. **For more information write or call: GRISCOM-RUSSELL CO., Massillon, Ohio.**

●

Completely Modern Package-Type Steam Boilers. Catalog No. A3-55 features a flow diagram showing the basic design features of Holmar boilers. Data and dimensions are shown in tabular form. **For more information write or call: VULCAN STEEL TANK CORP., P. O. Box 5292, Tulsa, Okla.**

●

Controlled Capacity Pumps and Proportioning Equipment. Designated as No. S-1254, this catalog covers all standard pumps (up to 1,500 psi.) and low-pressure pumps (up to 800 psi.). Both simplex and duplex pumps are included for capacities from a few cubic centimeters per hour to over 3,300 gal. per hour. In addition, va-

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for oil and gas industry

Immediate steel is more than a slogan—it's a fact, here at Ryerson.

Here, the world's largest stocks of carbon, alloy and stainless steel await your call. Experienced steel men who know oil industry requirements are ready to work with you. And unequalled facilities are at your disposal for sawing, shearing, flame-cutting and otherwise preparing steel to meet any need.

So whether you need a single piece or a truckload, when you need steel quickly—call your nearby Ryerson plant.

Principal products: carbon steel bars, structurals, plates, sheets, tubing—alloy steel bars—stainless steel sheets, plates, pipe, tubing, bars—safety plate, reinforcing steel, babbitt metal, plastic pipe, machinery & tools, etc.

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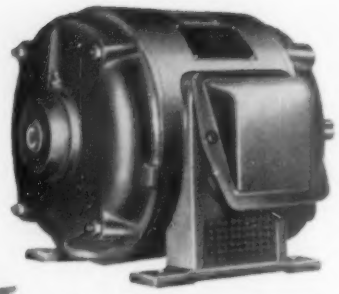
JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA CHARLOTTE, N. C. • CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

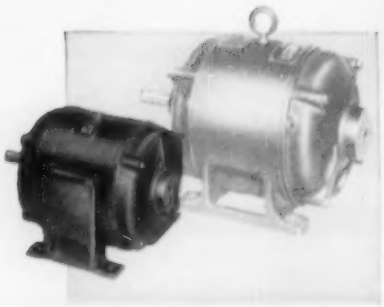
NEW Century WeatherGARD®

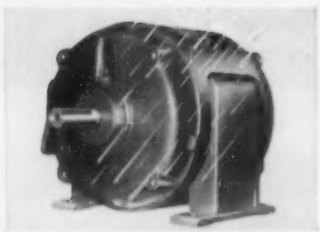
OIL FIELD MOTORS

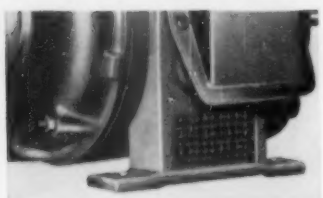


These are the new re-rated motors — now available in some ratings.

Improved to Provide Top Performance ... Long Life







SMALLER — LIGHTER

More uniform silicon-laminated steel; thinner, tougher "Mylar" slot insulation—just two of the many technical developments that help make these new Century Performance Rated Motors so much smaller and lighter.

NEW WEATHER-GARD CONSTRUCTION

New internal motor ventilating methods permit end bracket and frame design that gives far better protection from rain, snow and sleet . . . still maintain 40°C. temperature rise.

SCREENED OPENINGS

Screens in openings protect against birds, small rodents or animals, leaves or twigs from entering the motor.

EVEN MORE DEPENDABILITY

Improved plastic impregnating varnish and plastic insulated magnet wire provide unusual resistance to abrasion, moisture and heat. These new materials possess far better dielectric qualities. Die cast aluminum rotors are individually, dynamically balanced to assure freedom from vibration.

For more information *on these and other Century motors for the petroleum industry, see your supply store, or write Century for Oil Industry Bulletin 14-141-P1.*

Performance Rated® Century C MOTORS

1/6 to 400 H.P.

CENTURY ELECTRIC COMPANY

1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

876

rious control mechanisms are described which operate to vary the pump capacity by varying the stroke length of these reciprocating pumps while in motion. **For more information write or call: PHILADELPHIA PUMP & MACHINERY CO., 1513 Race Street, Philadelphia, Pa.**

●

Time Cycle Controllers and Metallic Mercury Switches. Bulletin No. 405 is a catalog listing prices and complete engineering data on models containing from 2 to 18 circuits in the time-cycle controllers and two types of metallic mercury safety switches. **For more information write or call: ELECTRIC SWITCH CORP., Columbus, Ind.**

●

Recording Spectrophotometer. A new eight-page brochure covers several types of recording spectrophotometers. Written to assist the prospective purchaser of recording spectrophotometers, this Bulletin 405 details the requirements for a variety of quantitative and qualitative applications and recommends the particular type of instrument for each use. **For more information write or call: Beckman Division, BECKMAN INSTRUMENTS, INC., 2500 Fullerton Road, Fullerton 1, Calif.**

●

100-Ton Block with Spring Duplex Hook is a perforated data sheet illustrating the outstanding features of a three-sheave traveling block and hook combination. All engineering and ordering information is included. **For more information write or call: THE GUIBERSON CORP., 1000 Forest Ave., Dallas, Tex.**

●

Electric Power in Petroleum Industry. The increasing electrification of the petroleum industry is graphically portrayed in the current issue of Motors in Industry, devoted entirely to the use of electric power in petroleum production, refining, and distribution. It describes and pictures recent applications of electric drives in such operations as petroleum transfer, catalytic cracking, thermal reforming, and chemical treatment. Since 1947, the consumption of electric energy by refineries alone has grown from 2,867,544,000 kw.-hr. a year to five billion. Hundreds of thousands of electric motors makes possible the advanced techniques and equipment that have enabled the petroleum industry to expand output and hold down prices of its finished products. **For more information write or call: ACEC ELECTRIC CORP., 40 East 49th Street, New York 17, N. Y.**

This new simplified digital gaging system remotely measures liquid levels in any number of tanks over a single wire pair of any length.

As illustrated, levels from the dialed tank are read from float-type gages and transmitted in precise digital form to the tank gage receiver. Tank number and level readings, in feet, inches and eighths, are displayed on easy-to-read lamp registers. Continuous monitoring or read-and-hold can be selected as desired. Optional features include automatic sequencing of tank selection, printed read-out by electric typewriter, and operation of card-punch apparatus.

The Electro-Span Tank Gaging System described above is one of many Bendix-Pacific accurate digital remote measurement and control systems. Electro-Span can be provided to:

1. **Remotely** measure liquid levels, flow, pressure, temperature or shaft position.
2. **Remotely** control pumps, valves, motors and similar equipment.

Under the Bendix-Pacific unitized construction, these systems are comprised of standard assemblies offering maximum flexibility with low cost. Utmost reliability, freedom from error, and long-term unattended life are inherent qualities of the Electro-Span system.

Engineering facilities are available for application of Electro-Span to your specific requirements. Your inquiry is invited.

PLEASE ADDRESS INQUIRES TO: DEPT. 831

Pacific Division
Bendix Aviation Corporation
NORTH HOLLYWOOD, CALIF.

EQUIPMENT MEN . . . in the News

Matched Frac Fleets in Operation

The Western Co., oil field service concern, is now handling its well-fracturing assignments with its new four-unit Matched Frac Fleets. The company has expanded in excess of $3,000,000 in developing the new units. They have all worked efficiently in actual field operations which covered more than 6 months.

The Tank-Mixer 10,000 has a 10,500-gal. capacity and a hydraulically driven shaft for agitation. The shaft speed can be varied from 0 to 60 r.p.m., allowing the rate of agitation to be adjusted to the type of fluid and the concentration of sand at any time. This unit's slurry pump has a capacity of 36 bbl. per minute which supercharges the treating pumps operating from either side.

The four units were designed by Western's mechanical-engineering department in Midland. The Frac Fleets include four separate pieces of mobile equipment centered around the new roller-bearing RB-80 pump. This unit is known as the "Fracmaster 600."

The Master-Mixer 40 is the second member of the fleet. The third unit is Tank-Mixer 10,000 and the fourth is the Transporter.

The concern now has approximately 20 of the four-unit fleets in operation and others are rapidly being completed and put in service.

Western plans to continue producing the new fleet units until it has enough units to handle all fracturing jobs at all of its stations.

The Fracmaster 600 is powered by 2 two-cycle diesel engines delivering 600 b.hp. to the pump. The pump drive is direct and mechanical through 10 speed transmissions and a new high-velocity chain compound. The RB-80 pump can operate at maximum horsepower for 3,000 continuous hours at 10,000 psi. It can pump approximately 80 g.p.m. at 10,000 lb. and 375 g.p.m. at 2,100 lb.

The new Western Master-Mixer 40 features a completely automatic mixer. It carries a 20-bbl. inventory tank. Sand is lifted to operating level by three 9-in., screw-type elevators and three 750-g.p.m., vane-type pumps which inject oil into the mixing tank. This unit automatically proportions sand to the fluid through manual setting in any ratio from ½ to 6-lb. per gal. at rates of from 5 to 40 bbl. per minute.

Emsco Names Euge Manager, California Machinery Sales

V. A. EUGE

The appointment of Vaughn A. Euge as manager of machinery sales for the California division of Emsco Manufacturing Co. has been announced by Lloyd M. Bush, California sales manager.

Euge joined the Emsco organization in 1933. He began employment as a helper in the chain-shop division and worked through the machine shop, assembly floor, production, warehouse, and sales-order department until 1947 when he became a member of the sales department.

Rio Engineering Names Gould to Cathodic Staff

Earl D. Gould has joined Rio Engineering Co. as project field engineer. He will specialize in cathodic protection of oil and gas-well casing.

Since 1948, Gould has been employed by Stanolind Oil & Gas Co. as a petroleum engineer and as a research engineer dealing with oil-field corrosion problems.

Much of Gould's work in the last 3 years has been directed toward the field and laboratory investigation of cathodic protection for oil-well casing to prevent external corrosion. He will continue to specialize in this work with Rio Engineering.

Lucey Products Purchases T. & C. Drilling Co.

Lucey Products Corp. and Philip Taber, president of T. & C. Drilling Co., have announced that Lucey Products has purchased T. & C. Drilling.

Lucey's plan of acquisition will result in the sale of the drilling equipment—which includes several rotary rigs for deep drilling—and the consolidation of other assets with Fraber Oil Co., a Lucey subsidiary.

Mid-Continent Promotes Hickman and Huestis

The promotion of C. H. Hickman to division manager at Wichita Falls, Tex., and G. L. Huestis to assistant division manager of the West Texas-New Mexico division, have been announced by Ken W. Davis, Mid Continent Supply Co. president.

Along with the transfer of Hickman, Davis announced that the North Texas district had been made a division of the organization. Included in the area

G. L. HUESTIS

C. H. HICKMAN

are stores at Abilene, Bowie, Gainesville, and Wichita Falls, division offices at Wichita Falls, and sales locations at Graham and Pampa. Hickman has been with Mid-Continent since 1937. He served the organization in Shreveport, Seagraves, Fort Worth, Houston, Kermit, and Odessa. Immediately prior to his promotion he was district manager at Odessa.

Prior to his promotion, Huestis was division machinery manager of the same area, which includes stores in New Mexico at Farmington, Eunice, and Hobbs; and stores in Texas at Midland, Brownfield, Andrews, Kermit, Odessa, Snyder, and Sundown. A sales office also is located at San Angelo.

Huestis has been with Mid-Continent since 1942, when he began as field salesman at the firm's Midland store. In 1944, he was promoted to division sales manager for West Texas and New Mexico. He was made chief engineer for the division in 1945. His promotion to division machinery manager was announced in 1949.

Dewey Supply Appoints Sample as Representative

Cecil R. Sample has been appointed field representative for Dewey Supply Co., Tulsa. He will work out of the store in Chickasha, Okla.

Sample, who has been in the oil-field supply business for over 6 years, was formerly with Woodco Supply Co. at Rush Springs, Okla.

Other personnel in the Chickasha store include Doug Evans, store manager and fieldman; Walter Ware, field and store man; and Jack Baker, floor man.

Pemex Engineers Visit United States

Seven Pemex engineers, headed by Luis Moran, chief engineer in charge of drilling and production for the government-operated company, are visiting the United States to gather information on permanent-well-completion operations. Shown above visiting the Otis Pressure Control plant in Dallas are: Jorge Malagamba; Jesus Rodriquez; Roberto Rojas Aliffita; and Moran. Seated are: Oscar Ortiz Ordonez; Humberto de Leon; Lowell M. Wilhoit, vice president for sales and service, Otis; Speck Suber, superintendent for Otis, Falfurrias, Tex.; T. G. Garwood, sales manager, Otis, and Pedro Hence Berasain.

North American Geophysical Occupies New Plant

North American Geophysical Co. has moved into its modern new building at Houston. The building contains 8,700 sq. ft. and is completely air-conditioned except for welding shop and stock room. The large new laboratory is electrostatically shielded for making fine electronic measurement. The shop includes equipment for custom anodizing and instrument engraving.

Byron Jackson Completes Sales Conference

Regional sales managers of Byron Jackson Co.'s oil-tool division got a preview of important new tool developments during the semiannual sales conference at the company's Los Angeles plant.

Garth Nicolson, vice president and manager of the division, presided at the meeting. Also present were: V. C. Horner, assistant manager of the oil tool division; C. F. Vincent, southern region; J. P. Magoffin, Rocky Moun-

Shown at BJ's regional sales-managers meeting are: Seated, V. C. Horner, assistant manager; G. F. Nicolson, vice president and manager; C. F. Vincent, regional sales manager, southern region; and R. J. Evans, Jr., regional sales manager, Mid-Continent region. Standing are: J. Fred Buckner, Lake Charles, La. region; W. C. Brooks, regional sales manager, western region; and J. P. Magoffin, regional sales manager, Rocky Mountain region.

There's one right way to buy pressure tubes—it's tube life per dollar: *Ask the experts!*

This month's report is on: **DM STEEL**

Has unusually high creep strength for a pearlitic steel, good stability up to 1200° F., fairly good corrosion and oxidation resistance. Has 2 to 3 times the life of carbon steel where corrosion is not severe. Recommended for cracking furnace tubes, hot oil lines, superheater tubes, high temperature steam piping and forgings for accessory parts.

ONE OF 24 TIMKEN HIGH TEMPERATURE STEELS

Carbon	Sicromo 2	Sicromo 5S	18-8 Ti
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	16-13-3
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-20*
Silmo	Sicromo 3	Sicromo 9M	25-12*
DM	4-6% Cr.-Mo.	18-8 Stainless	35-15**
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	16-25-6**

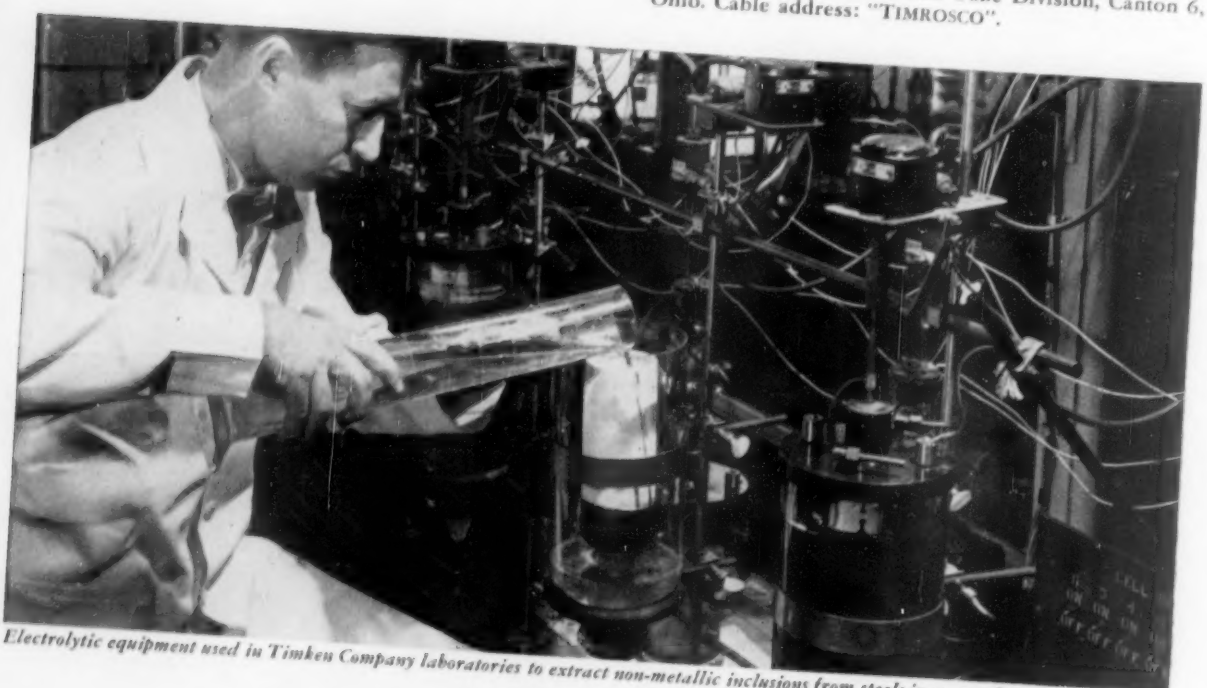
**Available as seamless tubing on an experimental basis only.*
***Not available as seamless tubing.*

YOU'RE fortunate in having the Timken Company's large choice of high temperature tube steels that will solve your heat, pressure, corrosion and oxidation problems. You're even more fortunate when you choose the *one* analysis that will give you maximum tube life per dollar—the only true index to actual tube steel cost.

To find it, *ask the experts!*

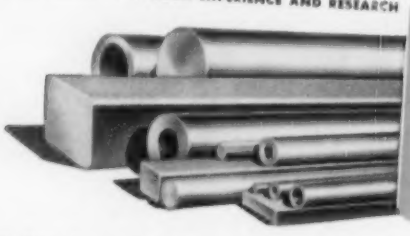
These experts are the metallurgists of The Timken Roller Bearing Company. They'll put their more than 20 years of steel research and experience—with emphasis on high temperature steels—at your disposal. Help you select from 24 different analyses the one tube steel that will give you the best life/cost ratio. Regardless of which analysis you select, you'll be assured of uniform quality. Because the Timken Company rigidly controls quality from melt shop through final inspection.

Let the Timken Company's metallurgists help solve your tube problems. *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



Electrolytic equipment used in Timken Company laboratories to extract non-metallic inclusions from steels in research on steel cleanliness

YEARS AHEAD — THROUGH EXPERIENCE AND RESEARCH



TIMKEN
Fine Alloy
STEEL

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

tain region; William C. Brooks, western region; R. J. Evans, Jr., Mid-Continent region; Fred Buckner, Lake Charles, La., region.

Nicolson said that new BJ developments in oil tools will lead to even greater safety and increased speed. The new developments were generally summarized in four major categories: power tools, including a power casing tong, a drill-tubing tong, and a power sucker-rod wrench; Safe-Lok protectors that have a lock-on feature which allows it to be quickly installed or removed by regular crews in just seconds; pumps and heavy-duty equipment including hooks, links and spiders; and elevators especially engineered to handle the heaviest pipe strings and large casing.

Cooper-Bessemer Makes Edick Branch Manager

G. W. EDICK

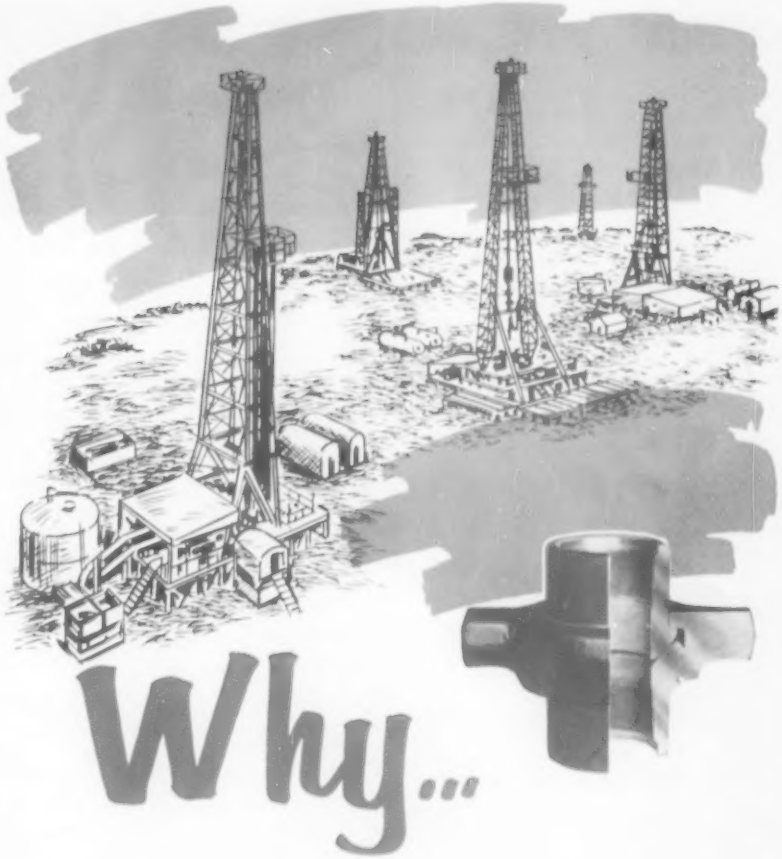
The promotion of George W. Edick to branch manager of compressor and stationary engine sales in New York City has been announced by Robert F. Lay, general sales manager of Cooper-Bessemer Corp., at Mount Vernon, Ohio. In his new assignment, Edick will have charge of centrifugal and reciprocating compressors and stationary engine applications in the domestic field throughout the New York area.

Edick joined Cooper-Bessemer in 1945 and served in the company's compressor engineering section. He was made manager of the compressor section in 1946, before his initial assignment to the New York branch office in 1949. Edick will report to Charles M. Reagle, vice president and eastern territorial manager.

Dowell Promotes Gore and Gionta

George L. Gore has been made district engineer and Alfred Gionta named district sales engineer for Dowell at Denver. The promotions were announced by E. H. Nielsen, district manager. Gore joined Dowell in 1949 and has served in various capacities at Great Bend, Kans., and Tulsa. He was transferred to Denver in August 1954, as petroleum engineer.

Gionta joined Dowell in 1946 as a service engineer at Houston. Later he became station manager at Houma, La., and in 1950 joined United Oilwell Service, S.A., Dowell's South American subsidiary. For the next 2½ years he



Why...

standardization with WECO UNIONS
...Saves you *TIME* and *MONEY*!

• When you transfer pumps, mud lines, swivels, standpipes, rotary hoses, blowout preventer manifolds and similar equipment from one rig to another—standardization with WECO provides you positive matching and mating of unions . . . minimizes errors of makeshift and misfit connections . . . eliminates necessity for replacing complete unions . . . assures perfect, leak-proof sealing on all your lines.

This time-and-money-saving standardization is made possible by the complete interchangeability of WECO Unions in the same size and pressure rating. That's why alert drilling contractors are finding it is wise to standardize with WECO.

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WELL EQUIPMENT MFG. CORP. • Division of Chikson Company • HOUSTON 1, TEXAS

this ___ __
_ _____ is
"Tuffy Nuff"

SEE PAGE 117

Associated Oil Field Rentals Holds Sales Meeting

The sales force of Associated Oil Field Rentals assembled at the Houston home office recently for a 3-day meeting led by vice president and general manager Ralph Neuhaus and vice president and operations manager Olive Dorroh. Sales personnel attended from the company's 10 branch equipment-rental yards. Pictured are: (front row) Roger Eason; Ralph Neuhaus; Jack Kelley; Cliff Braswell; Grover Pool; Olive Dorrah; Jack Lubbes; Naomi Haynes; A. F. Criger; Jack Ray; and Douglas McWilliams. In the back row are: F. J. Wilbanks; Charles Tuminello; R. F. Hopkins; Chet Smith; Wood George; Box Jarmon; Johnny Toudouze; D. D. Warren; Jack Rankin; Bub Williford; and Gene Thompson.

was United's western Venezuelan manager at Maracaibo. He returned to Dowell in 1953 as area engineer at Casper, Wyo., a position he held until his recent promotion.

Schlumberger Opens Two Field Locations

Schlumberger Well Surveying Corp. has opened two new field locations to serve the Rocky Mountain area.

Offices have been opened at Grand Junction, Colo., under the direction of John Rusen. Rusen was transferred from the Vernal, Utah, location which has been closed.

At Rock Springs, Wyo., operations have been started with R. E. Kudrle in charge. Kudrle was formerly a field engineer at Casper, Wyo.

Robinson to Construct New Plant at Houston

A new plant site has been located for the Robinson Orifice Fitting Co. of Texas, Inc., according to a recent statement by Oliver W. Muff, general manager. The site consists of five acres in the Houston industrial district. The manufacturing plant and office are now under construction.

This firm will manufacture orifice fittings and meter runs for distribution in the Mid-Continent and Gulf Coast territory.

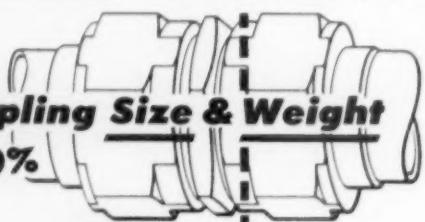
Italian Firm Licensed to Make Ideco Drilling Rigs

Dresser Aktien-Gesellschaft, the European affiliate of Dresser Industries, Inc., of Dallas, has concluded an agreement with the Nuova-Pignone Co., a subsidiary of Ente Nazionale Idrocarburi (ENI), for the manufacture of Ideco drilling rigs and allied drilling equipment in Italy.

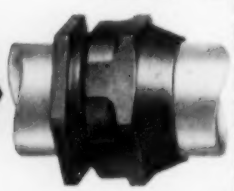
The agreement was announced in Rome, Italy, at the World Petroleum Congress, by officials of Dresser A. G. According to J. S. O'Connor, executive vice president of Dresser Industries, and G. W. (Jack) Walton, executive vice president of Ideco, a Dresser operating subsidiary of Dallas and Beaumont, Tex., the move is in keeping with an established Dresser policy of further world-wide expansion by Dresser operating companies.

Both O'Connor and Walton felt the new agreement would help meet in-

Reduce "AN" Coupling Size & Weight by more than 50% with



RUBBER TECK'S
RIGID, LIGHTWEIGHT
DUCT CONNECTOR



Other
RUBBER TECK PRODUCTS
- Flexible Breakaway Connectors
- Flexible Hot Air Duct Connectors
- Flexible Fluid Line Connectors

COMPARATIVE SIZE AND WEIGHT REDUCTIONS

"AN" DESIGN	RUBBER TECK DESIGN
Overall length (2" dia.)....5.25 in.	(2" dia.).....2.00 in.
Number Parts 5	 3
Weight .....1.66 lbs.	.....0.53 lbs.
Material .....Aluminum	..... Aluminum

Also available in stainless steel.

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Berea 4-7837

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Clifton 4-9671

creasing foreign demand for the oil, gas, chemical, and industrial equipment manufactured by companies of the Dresser group.

Acceptance of an order for two million dollars worth of drilling equipment to be manufactured at Ideco's Beaumont plant was also announced by Walton. "Prompt fulfillment of this order and early delivery of the equipment will simplify servicing problems during the early stages of the agreement," he said. "In the future, similar equipment will be produced by Pignone in Italy on a royalty basis."

Stamberger Boosted to New York District Post

Richard J. Stamberger, New York district sales representative for Youngstown Sheet & Tube Co., has been appointed assistant New York district sales manager, it has been announced by J. M. Tuthill, general manager of sales.

Stamberger started with Sheet & Tube as a sales trainee in 1940 and, since completing the program, has served as a salesman in the company's Indianapolis, Columbus, and Detroit district offices. He joined the New York sales office in March 1952.

Oilwell Appoints Lakey and Scott as Representatives

Appointments of Wilburn D. Lakey as field representative at Beaumont, Tex., and of Harold William Scott as field representative at Avenal, Calif., for U. S. Steel's Oil Well Supply Division have been announced.

Employed in 1953 by Oilwell as storeman at Beaumont, Lakey held that position until his present appointment.

Scott was employed by Oilwell at Avenal in 1953. Later that year he was appointed store manager at this location, the position he held until his present appointment.

OPW Corp. Purchases Jordan Regulator Corp.

Gilbert B. Richards, president of OPW Corp., Cincinnati, has announced that his company has completed purchase of Jordan Regulator Corp., manufacturers of pressure and temperature-regulating valves for industrial applications.

The newly acquired company will be known as Jordan Corp. and will function and operate as a division of OPW with factory and offices in Cincinnati. Elected officers are G. L. Ohrstrom, chairman of the board; G. B. Richards, president; R. W. Gronauer, vice president; W. D. Boone, vice president; and E. W. Darenkamp, secretary and treasurer.

Cyanamid Announces Three Changes in Sales Staff

Three appointments within the refinery chemicals department of American Cyanamid Co.'s industrial chemicals division were announced today by R. E. Sumner, division manager.

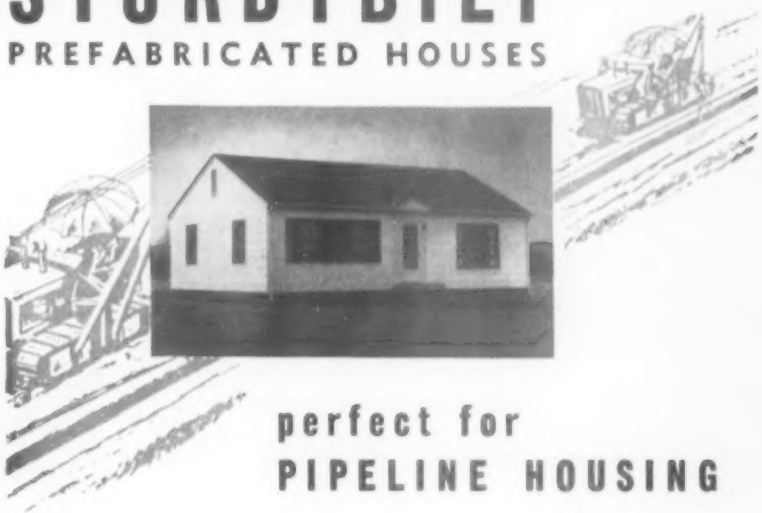
Ben H. Loper was named Chicago sales representative. C. O. Brown, Jr., was appointed New York sales representative, and Read Larson was appointed assistant to the department's technical director.

Loper was associated with Reynolds Metals Corp. previous to joining Cyanamid in 1950 as a chemical engineer. He has served the company as a plant engineer and technical representative. His sales territory will include Midwest and Rocky Mountain areas.

Brown joined Cyanamid in 1949 as a chemical engineer and has been in sales since 1952. He will coordinate national sales of Aero specialty catalysts.

Larson will act as liaison between departmental research, development, production, and sales functions.

STURDYBILT
PREFABRICATED HOUSES



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When pipeline camps are needed far away from cities or towns, STURDYBILT houses will fill your housing need. The prefabricated sections are loaded on trucks, moved to your site and erected in days instead of weeks.

Many leading pipeline companies have proved to themselves that STURDYBILT Houses are the perfect answer to pipeline housing problems. Ask about our purchase or leasing plan.

MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF CURTIS WOODWORK, JOHNS-MANVILLE BUILDING MATERIALS

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

definitive data cuts well costs

GUARD LOG MORE ACCURATE IN LIGNITIC AND INVADED ZONES

When erratic lithology and lignite streaks distort conventional logs, Halliburton's Guard Log can help cut well costs by providing sharp and definitive production data. Coring and other time consuming operations can be reduced to a minimum—even in areas where poor definition by conventional systems prevents reasonable interpretation.

In the Lower Wilcox of the Upper Coast Region of Texas—where productive sands are characteristically cross-bedded, fine grained sand members separated by thin strings of lignite—the accuracy and economy of Guard Log has been proved. Although mud filtrate invasion, shielding and distortion of the long lateral curve usually prevents accurate interpretation, the Guard Log gives accurate data on hydrocarbon zones and their order of permeability.

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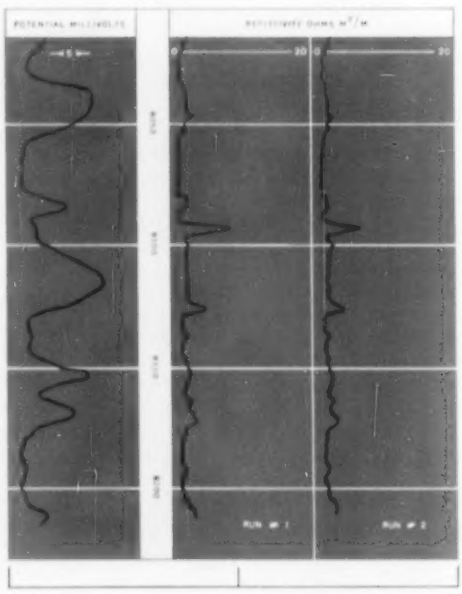

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EXPLORATION

Drill May Provide Answer to Michigan's 64-Dollar Question

by John C. McCaslin

EXPLORATORY INTEREST in Michigan has shifted to the southeastern rim of the basin where first oil production from the Niagaran-Silurian was recently opened.

WILL the Niagara and Trenton formations be the deep pays that are needed to make Michigan a really important oil and gas producer?

That's the exploratory question of the year in the Wolverine State. The industry is seeking the answer on a series of folds that jut into southeastern Michigan from the Findlay arch of Ohio. On one of these anticlinal features, the Northville pool in Wayne and Washtenaw counties has furnished some clues for solving the difficult question.

A new-pay discovery . . . The first important oil discovery for the state in 1955 is a Silurian strike in Northville pool. It brings oil production within sight of Detroit.

The Taggart Co. 1 Crowe-Fraser et al., 7-1s-8e, Wayne County, flowed 174 bbl. of oil in 4¼ hours on a drill-stem test in the Niagara at 3,046-3,190 ft. Previously, the only oil pays tapped in the pool were in the Trenton-Black River Ordovician section at about 4,200 ft. The Dundee-Devonian, Niagara, and Trenton sections have all carried gas pays here. No water showed on the Niagara drill-stem test.

This well, originally spudded as a Trenton gas test, will probably be owned jointly by Taggart and Pure Oil Co. They own the bulk of the acreage immediately surrounding the new oil discovery. The well lies about 1 mile southeast of the Taggart 1 LeMaster Trenton oil discovery well, the 1954 exploratory highlight in Michigan.

This is the first Niagara oil production of commercial merit outside Ohio. There is some gas production from the Niagara in Seneca and Ontario counties, New York, and five Michigan fields produce Niagaran gas. There are two other wells in Michigan which are called Niagara oil producers, but these appear to produce from the basal Salina-Niagara contact point. One of them is a lone producer in Mason County; the other is a lone and small producer in Otsego County.

Opens a new round . . . The Niagara pay at Northville gives this area its second oil-producing horizon.

Early in 1954, first Trenton oil production was opened in the field. This called for a complete reappraisal of southeastern Michigan's potentialities as an important producing area of the Great Lakes province. Northville has 18 wells capable of producing oil and gas from the Trenton lime, but only the discovery well, Taggart 1 LeMaster, is capable of producing the allowable. There are eight Trenton gas wells in the field. High gas-oil ratio production has discouraged continued 10-acre development.

Deerfield pool in Monroe County, opened in 1920, is the only other Trenton oil field in Michigan. Production there is nil. The Trenton is an old-time producer in the Toledo area of Ohio and in the Trenton gas fields of Indiana and Ohio. It produces also in Kentucky and Virginia.

Southeast Michigan exploration . . . The Niagara discovery at Northville is a boon to the deep-stratigraphic success hopes of southeastern Michigan.

Geophysical crews have worked and reworked the entire area since the discovery of Trenton oil. Exact importance of the Trenton awaits the drill and perhaps several years of work. The Northville-Trenton discovery contributed important structural data. Other Trenton tests are necessary to add to this information.

The structure at Northville is a sharp anticlinal fold trending northwest-southeast. Although the field is a prominent anticlinal trend, Trenton production is partially controlled by limestone dolomitization. Cores from Northville wells show vugular porosity and indicate this sequence of events:

1. Fracture.
2. Solution and development of cavernous porosity in the fractures.
3. Deposition of dolomite crystals along the cavity margins.
4. Accumulation of oil in the remaining porosity.

Lack of dolomitization has resulted in dry holes in the Northville area. The dolomitization and resulting porosity are concentrated near the crest of the anticline where folding created crevices that encouraged the dolomite deposition.

Southeastern Michigan structure is controlled by the Findlay arch, one of the forks of the Cincinnati arch. The Cincinnati arch is the controlling structural influence responsible for Ohio's Trenton production. The Findlay arch is an important structural influence on the anticlinal folds that radiate northwest from the arch across the Michigan basin. It is on these folds that the question of southeastern Michigan's potentialities will be answered.

REGIONAL SETTING of Great Lakes and Appalachian provinces showing extent of Trenton production.

Here's a two-article study of . . .

An Old Pay With a Future

1. Trenton production in eastern U. S. and Canada

by John Sanford

THE Trenton is present and has shown possibilities for production over a wide area in both the United States and Canada. Because of stratigraphic proximity to the pre-Cambrian rocks over large areas of Trenton occurrence, the basement complex may have exerted considerable control over both the depositional and postdepositional development of the Trenton.

Exploration has been largely concentrated in the areas where the Trenton occurs at relatively shallow depths, and the formation has not been adequately tested.

Fracture and solution porosity, sometimes accompanied by dolomitization, have played a major role in localizing Trenton production. Bioherms do not seem to have been usually responsible for the accumulation of Trenton oil and gas, but they offer a possibility which should not be entirely discounted.

Since accumulations of hydrocarbons can apparently occur in any portion of the formation and at various horizons in the same section where sufficient porosity has developed, it would seem that the Trenton itself might frequently be the source of the oil and gas.

Author is associate professor of geology, Wayne University. This article consists of portions of a paper originally presented at the Michigan Geological Society's Ordovician Symposium. The full paper will appear later in the society's "Proceedings."

Trenton . . . The term "Trenton" as used by the petroleum industry is more inclusive stratigraphically than the same term as defined by stratigraphers. In eastern North America there is fairly general agreement in the industry in including both Trenton and Black River formations under the general term "Trenton." And the term will be so used in this discussion.

This inclusive term is the result of difficulties involved in subsurface differentiation of the many units into which the Trenton, or Trentonian, has been divided. In addition, it is difficult to select, from an examination of well cuttings, a Trenton-Black River boundary which is strictly correlative with this contact as picked in surface exposures where adequate fossil information can be obtained. The solution of stratigraphic problems tends to be more clear-cut in marginal areas than in the deeper portions of basins where formations and sequences are more complete.

Distribution of areas of outcrop of the Trenton are largely controlled by proximity to old positive features and by uplift and folding accompanying the Appalachian orogeny. These areas are shown on geologic maps, and the outcrops may contain the keys to the solution of some of the problems of the petroleum geologist. But too great a reliance on surface exposures may confuse issues. The true area of occurrence should always be kept clearly in mind. Since the Trenton has not been cut out by old highs such as the Findlay arch, it can be assumed to be nearly universal in occurrence within the margins of the Michigan Basin and in nearby areas. This continuity of the strata should be a primary consideration in the solution of all Trenton problems.

Let's look at several commercial or semicommercial discoveries which illustrate the general character of known Trenton production and permit some conclusions regarding Trenton possibilities.

Rose Hill field . . . Rose Hill field is located in the southwestern corner of Virginia in a fenster, and the pool as described by Miller (1948) is confined to the stationary block. After repeated tests in the area dating from 1910, production was discovered in the lower part of the Trenton at a depth of 110 ft. in 1942. Dry holes have been drilled both to the east and west of the discovery, so its location was indeed a fortunate circumstance. A number of wells were drilled in 1946 and 1947 with production ranging from 10 to 50 bbl. per day after they had settled

down. Most of the production is from the Trenton.

Miller (1948) indicates that the oil is not confined to one or two horizons, that it is erratic in its occurrence and is not related to dolomitization. Accumulation is believed to have taken place in a system of interlocking fractures along which there has been solution. There may be a relationship between the capacity of the wells and the amount of solution. The faulting has caused erratic sections in wells short distances apart. The Trenton is probably the source rock.

New York State fields . . . Production of gas in an area near the eastern end of Lake Ontario, which may be considered as flanking the Adirondack highland, dates from 1888 with the discovery of the Clyde field. Kreidler (1953), who reviewed this area, describes eight fields, six of which date from the 1880s and 1890s. Tug Hill field was discovered in 1933 and Camden field in 1934. Most of the following review of the New York fields is summarized from Kreidler's work.

The large fields include Fulton, Pulaski (80 wells distributed over 18 sq. miles), and Sandy Creek, the latter being the only one of the New York Trenton fields currently listed as active. Sandy Creek was discovered in 1889 and was active for 50 years. There has been an attempt recently to clean out and acidize the wells with the hope of reviving production. The maximum depth of the wells in this field is approximately 1,200 ft.

Depths to the Trenton in this area vary with distance from the Adirondack oldland. The top of the Trenton may be as deep as 2,600+ ft. in the Clyde field, but the greatest total depth of any well in the Rome field is approximately 900 ft. Initial flows in the Rome field varied, but were as high as 2 to 3 M.M.c.f. Fairly high initial pressures with an extremely rapid decline seem to be characteristic of the Trenton in New York.

The term "Trenton" as used by the industry in New York includes beds of Black River age. Kreidler (1948, p. 16) believes that the Trenton gas occurs in "fractured zones, joint planes, cavities, shale partings, and shale beds." He says it is "believed that coral reefs within the Trenton serve as a reservoir for some of the gas." He suggests that southwestern New York "where the Trenton is predominantly a limestone which may be more dolomitic" is the most promising area for Trenton exploration.

Mantoulin Island . . . The data regarding the occurrence of oil and gas on Manitoulin Island are summarized in the Michigan Geological Society guide book (Sanford & Moseley, 1954, p. 2). Approximately 90 tests have been drilled since the beginning of exploration on the island near some oil springs in 1863. Eighteen of these tests were completed since 1937, with three completed as oil wells and one as an oil and gas well. All of the oil was produced from various horizons in the Trenton. It is doubtful if any of the wells were produced over a very long period of time.

These data are chiefly of interest in showing the extent of the area of possible Trenton production. The nearness of these wells to the outcrop of the Trenton and the relative thinness of the associated section may be considered an argument in favor of considering the Trenton beds as a source rock for the oil and gas.

Hepworth gas pool . . . Hepworth gas pool is located in Amabel Township, Bruce County, Ontario. This small pool was discovered in 1900 and seems to have been abandoned about 1939. It, like Mantoulin, is of interest in demonstrating the extent of the area over which Trenton production is possible.

Dover field . . . Dover field in Dover Township, Kent County, Ontario, lies near the margin of the Michigan basin, just west of the Findlay arch. In conjunction with the Michigan fields, it may shed considerable light on the occurrence of and prospects for additional Trenton pools.

The field was discovered in 1917 and still has a small amount of production. From its discovery through 1952, over 11,000,000 M.c.f.g. and 230,000 bbl. of oil were produced. These figures are approximations since production is frequently reported by townships rather than fields. The production for 1952 for Dover Township is reported (Harkness, 1953, p. 25) as 2,704 bbl. The productive area was at first thought to be located in a syncline, and the field is structurally low. This accumulation of the oil and gas is not related in any way to structural position but is controlled entirely by the development of fracture porosity on the low side of a fault while the upthrown block remained tight.

Lima-Indiana Field . . . The geology of this field has been reviewed by various authors. The association of the accumulation of oil and gas with areas of solution and dolomitization of the Trenton along old arches is a familiar concept. The possibility that faulting played a part in the producing of the porosity is indicated by Cohee (1948, p. 1446).

Michigan Trenton fields . . . There is the distinct possibility that some of the production is associated with fracturing and the subsequent solution of the fracture zones. Cores from the Northville area show vugular porosity and indicate the following sequence of events:

1. Fracturing.
2. Solution and the development of cavernous porosity in the fractural zones.
3. Deposition of dolomite crystals along the margins of the cavities.
4. Invasion of the remaining porosity by hydrocarbons.

One core shows a tabulate coral in which the original pore space has been partly filled with dolomite crystals which are in part coated with inspissated hydrocarbons. This is not considered to indicate the presence of a bioherm.

2. Where the Trenton produces in Ohio

by George Shearrow

THE discovery of oil in Ohio has been traced back to 1814, almost half a century before the Drake well. In Noble County at the village of Olive, a well was drilled for salt and the oil which was encountered at a depth of about 350 ft. was considered a nuisance. Sufficient quantities of gas caused this well to erupt, periodically throwing water and oil to a height of 30 ft. The old hollow sycamore log used as surface or drive pipe can still be seen today.

The presence of oil and gas in the Findlay area was first noticed in water wells, springs, and seeps along creek beds. Much of the water supply contained hydrogen sulfide. The gas and oil rose from depths through the fractured limestones and dolomites up to the glacial drift. Small accumulations were held by the till that overlies much of the area.

The early discoveries in northwestern Ohio were almost simultaneous. All major pools were discovered prior to 1900. The most recent pool was discovered in 1935 south of Kenton in Hardin County. Exploratory wells to the Trenton since that date have been few, and no major quantities of oil or gas have been discovered.

The estimated number of wells drilled

Author is with Ohio Department of Natural Resources, Columbus.

to the Trenton is between 70,000 and 100,000. Robert L. Alkire (1952) has estimated 70,993 wells have been drilled; 61,715 produced oil, 8,242 produced gas, and 1,038 were dry holes. In 1953, 1,380 wells were still active.

The economic feasibility of secondary recovery in the old Trenton area is questionable. The lack of information concerning the reservoir characteristics, locations of wells, and methods of plugging have discouraged attempts for a program of this nature.

No discoveries have been made outside of this area. In southeastern Ohio, the Trenton has not been adequately tested. The W. T. Longworth well completed in 1943 to a depth of 7,466 ft. disclosed very little porosity in the Trenton section. A show of gas was encountered at 7,368 ft. about 500 ft. below the top of the Trenton. Other wells drilled to the north of this well have been equally discouraging.

Pay zones . . . The pay zones have thus far been found in the upper 200 ft. of the Trenton. The porosity is limited to the dolomites and dolomitic limestones with the exception of the faulted areas. Below the depth of 200 ft. the dolomitized streaks are very thin and probably do not extend laterally for any distance. To the south and east of northwestern Ohio, the upper part of the Trenton as well as the lower part is a dense to lithographic limestone.

The Trenton may have been a positive land area or at least exposed to meteoric waters just prior to or during the early development of the Cincinnati arch.

The dolomitized area has both interstitial and vugular-type porosity. The porosity is not limited to the faulted areas but can be found in the well cuttings throughout the producing areas of northwestern Ohio. The possibility of artesian waters rising from deeper dolomite through master fissures produced by local diastrophism as Landes, 1946, believes is doubted. The writer has found no evidences of solution cavities or thick dolomitized zones in the lower part of the Black River limestone.

Although the well cuttings examined are at random locations, the information gained thus far points strongly to the idea of a disconformity at the top of the Trenton. The thickness of the Trenton varies from 60 to 100 ft. in the producing areas. The type of porosity throughout the entire producing area indicates the Trenton was either a positive land area or at least exposed to meteoric waters.

The results of a more concentrated study of the sediments and the tectonics would give a clearer picture of Trenton and the accumulation of oil and gas within its reservoirs.

EXPLORATION HIGHLIGHTS

HUGOTON EMBAYMENT

SOUTHWEST KANSAS

Kansas Spotlight Shifts To Rank Comanche County

Comanche County has an indicated Mississippian discovery at Sunray Mid-Continent and Trans Era Petroleum Co. 1 Robinson, SE SE NW 5-31s-18w, 10 miles southeast of new Mississippian gas production in Kiowa County, Kansas. The new Comanche prospect is waiting on cable tools for completion after a successful drill-stem test at 5,060-80 ft.

Comanche County has only one producing area . . . Robbins Ranch gas field. Southeast of Coldwater, Kans., Sun Oil Co. and Aladdin Petroleum Co. 1 Gates ranch, SE SE 18-34s-16w, an important Mississippian prospect, recovered oil shows on a pair of tests. The county has no oil production.

OKLAHOMA PANHANDLE

Distillate Gage Turned In for Texas Discovery

Oceanic Oil Co. 1 Burdge, northeastern Texas County gas-distillate discovery, flowed 21,000 M.c.f. of gas per day plus 6.5 bbl. of distillate per million from perforations at 6,484-6,500 ft. in the Morrow. This is the first Morrow production inside Hugoton field's Oklahoma sector. The new strike is located in the SW NE 20-6n-16eCM, 2¾ miles north of a depleted Des Moines-Penn oil well at 1-A Swinger, and 7½ miles northwest of a dry hole at 1 McAdam.

Southeastern Beaver Test Promises Important Well

Production tests at a rank Beaver County wildcat lend a note of promise to the potentialities of the southeastern sector of the Panhandle county. Colorado Oil & Gas Co. is still testing at its 1-3 Armstrong, located in SW SW 3-2n-27eCM, 1 mile north of the town of Madison. The rank test is 16 miles southeast of Southwest Camp Creek, closest production.

The new discovery made 1,579 M.c.f. of gas per day after treatment in the lower Morrow sand at 7,688-7,706 ft. Later it increased to 1,628 M.c.f.

New well on Beaver trend . . . The northeast-southwest production trend in Beaver added a new discovery at J. M. Huber Corp. 2 School Land in NW NE 4-4n-23eCM, 3½ miles northeast of Beaver City.

The new well is still testing after flowing 1,260 M.c.f. of gas per day from Morrow perforations at 6,521-91 ft. A previous test made 2,060 M.c.f. daily after acid.

TEXAS PANHANDLE

Deep Well Tests Ninth Granite Wash Pay Zone

Phillips Petroleum Co. has uncovered three new pays at its 2 Delp in Section 110, Block M-2, BS&F Survey, 7 miles southwest of the town of Miami in Gray County, western Anadarko basin area.

This brings to nine the number of granite wash pays. A drill-stem test at 9,840-57 ft. got 9,000 M.c.f. of gas per day plus 1½ bbl. of distillate. Another test at 9,852-78 ft. made 2,510 M.c.f. per day plus 5 bbl. of distillate. A test at 9,900-35 ft. made 11,300 M.c.f. per day and 3 bbl. distillate. This well is ½ mile northwest of Laketon-Delp field's discovery well. It is also 1 mile northwest of the first Ellenburger oil well in the entire Panhandle area.

MID-CONTINENT

NORTH TEXAS

Oil Creek Sand Area Opened in Cooke County

A heavy flow of oil on potential test opened Oil Creek sand production in eastern Cooke County, 3 miles west of Callisburg, at Tom Cook 1 Cook. Testing through 10/64-in. choke, the well flowed 436 bbl. of oil from pay at 5,364-89 ft. Flowing pressure was 45 psi., gas-oil ratio was not disclosed.

Caddo Limestone Prospect In Foard County

Two successful drill-stem tests have been made at Lucerne Corp., Magnolia Petroleum Co., and Dilworth Hager 1 Rasberry, wildcat located 9 miles northwest of Crowell.

On test at 6,023-6,140 ft., open 2 hours, gas flowed in 50 minutes and recovery was 45 ft. of oil-cut mud, 180 ft. of slightly mud-cut oil, and 90 ft. of clean oil. Bottom-hole flowing pressure was 175 psi.

Second test, at 6,140-60 ft., had gas

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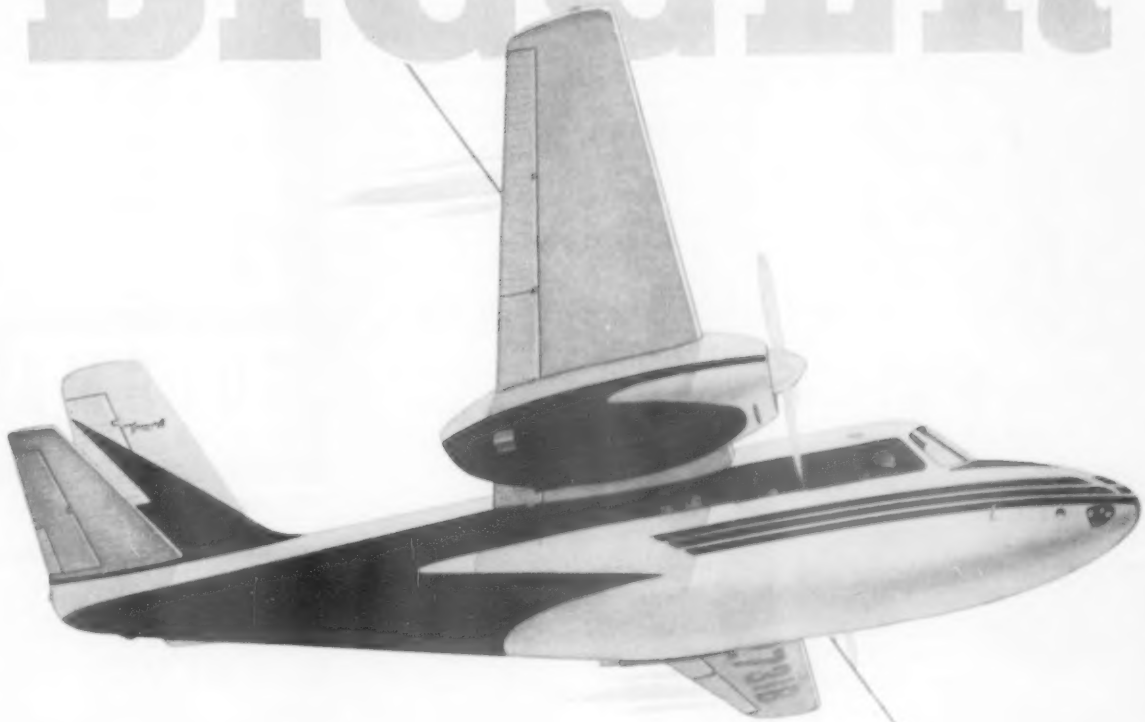

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SEE PAGE 117

in 5 minutes and oil in 85 minutes, with no estimate made on the flow. Recovery in the pipe was 40 bbl. of oil, plus 2 bbl. of mud-cut oil. Bottom-hole flowing pressure was 925 psi.

This well was drilled dry in 1940 to 5,739 ft., and re-entered when Lucerne and Associates 1 Bowley, wildcat ¾-mile south, showed oil in the Caddo at 6,118-34 ft.

Caddo Discovery in Parker County

Northern Parker County gained a new Caddo pool at W. J. & John J. Moran 1 Moody, wildcat 8 miles north and slightly west of Weatherford. Pumping potential was 59 bbl. of 42° oil from casing perforations at 2,840-50 ft. Gas-oil ratio was 800:1. Nearest production is 5 miles northeast in Taylor-Canyon field.

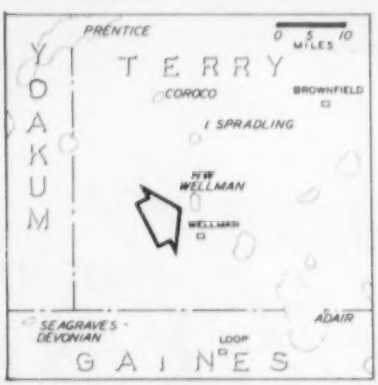
WEST TEXAS-NEW MEXICO

WEST TEXAS

Second Producer Seen at Northwest Wellman Field

Anderson - Prichard Oil Corp. had prospects of a second well for the Northwest Wellman field in southwestern Terry County.

The firm's 2 Oil Development Co.,



Northwest Wellman field is in line for a second Siluro-Devonian producer at Anderson-Prichard 2 Oil Development Co.

a south offset to Anderson-Prichard's discovery, placed top of the Siluro-Devonian pay at 12,764 ft. After many days' delay by lost circulation, operators ran casing to 12,700 ft. Production tests developed 427 bbl. of oil, with no water, in 8½ hours through various chokes ranging from 12/64 to 32/64-in. Potential test was under way at this report.

Location of the well is in Section 152, Block D-11, D&PRR Survey. Top of the Devonian in the second test was

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about flat with the discovery, at minus 9,439 ft.

Texaco 1 Spradling, prospective discovery north of the Anderson-Prichard wells, was still trying to make a producer. Swabbing on perforations in the Siluro-Devonian at 12,755-60 ft. produced 231 bbl. of fluid, which was 20 per cent oil, 10 per cent sediment and the balance salt water. These shot holes were squeezed and operators drilled out cement.

Upton County . . . Williamson & Roden 1 Chancellor, 10 miles east of Crane and west of Amacker-Tippett field, made a heavy flow of oil from an unidentified section at 8,800-8,925 ft. Drill-stem test at that interval, open 25 minutes, had gas in 5 minutes and oil in 10 minutes. Flow of oil was estimated at 50 bbl. an hour. Drilling continued toward projected depth of 9,400 ft.

No. 1 Chancellor is a south offset to the same operators' 1 Windham, which flowed oil at the rate of 30 bbl. an hour on a test of the Strawn at 9,310-72 ft. No. 1 is projected to 14,000 ft., and was drilling ahead below 12,855 ft.

Ector County . . . William D. McBee 1 TXL, deep project 9 miles south of Odessa, recovered oil and gas-cut water blanket and 90 ft. of oil and gas-cut mud, on a 1-hour test in the Ellenburger at 14,035-90 ft. Drilling continued. Sample-top on the Ellenburger was 14,050 ft.

GULF COAST

TEXAS GULF COAST

Stanolind Gets Gas in New Victoria Discovery

Stanolind Oil & Gas Co. has a new gas-discovery well in the northwest corner of Victoria County, near the DeWitt County line. It is 4 miles south of Metersville (southwestern DeWitt County), and east of Meyersville field, on the Victoria-DeWitt county line.

The new well, 1 Moritz, completed in the Massive A-1 sand, perforated at 8,590-8,600 ft., is shut in without gaging while waiting on market outlet.

DeWitt Wildcat Indicates New Gas-Distillate Field

Promising gas-condensate showings have been encountered in a wildcat test Argo Oil Corp. and Byron Rife are drilling 12 miles east of Cuero, in DeWitt County. The test is their 1 Thompson, in the Nicholas Peck Survey. Nearest production is 3 miles south in Helen Gohlke field.

Showings are in Wilcox sand below 7,950 ft. First drill-stem test, open 10 minutes through ¼-in. chokes from 7,958-90 ft., gaged bottom-hole flowing pressures from 2,670 to 2,870 ft. and 15-minute shut-in pressure of 3,480 psi. Recovery was 20 ft. of distillate with a trace of water.

Another test with hole deepened to 7,996 ft. and taking in from bottom of the previous test, recovered 5 gal. of distillate with about 370 ft. of muddy water. Tool was open 20 minutes through ¼-in. chokes. Bottom-hole pressures were 1,955 to 1,980 ft., flowing, and 3,480 psi., shut-in.

Cores to 8,012 ft. recovered sand with slight fluorescence.

Dual-Pay Well Extends Aldine Area Production

Production in the Aldine area, north of Houston, in Harris County, is being extended eastward by a new two-pay well completed by Slick Oil, Ltd., and Meridith & Co.

The well, 1 Weary, in the E. Farris Survey, is 3 miles north of Aldine townsite. Its pays are in Yegua sands,

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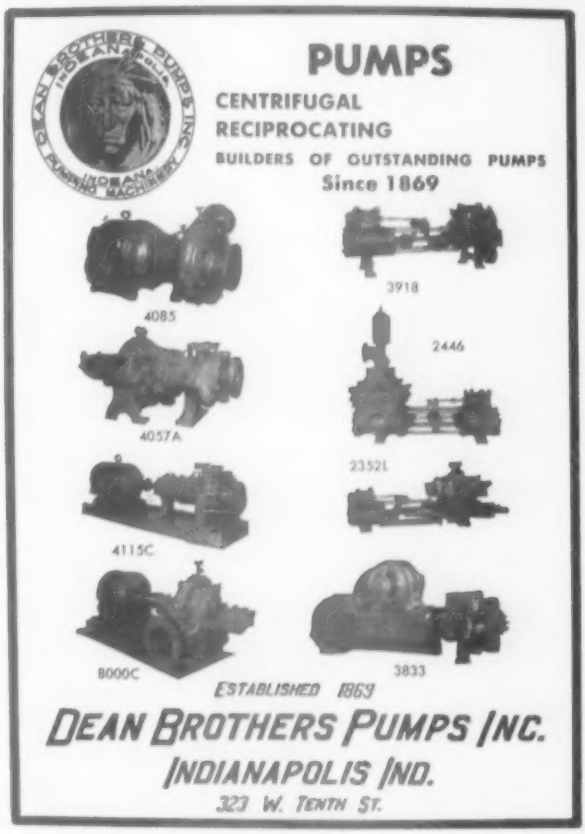

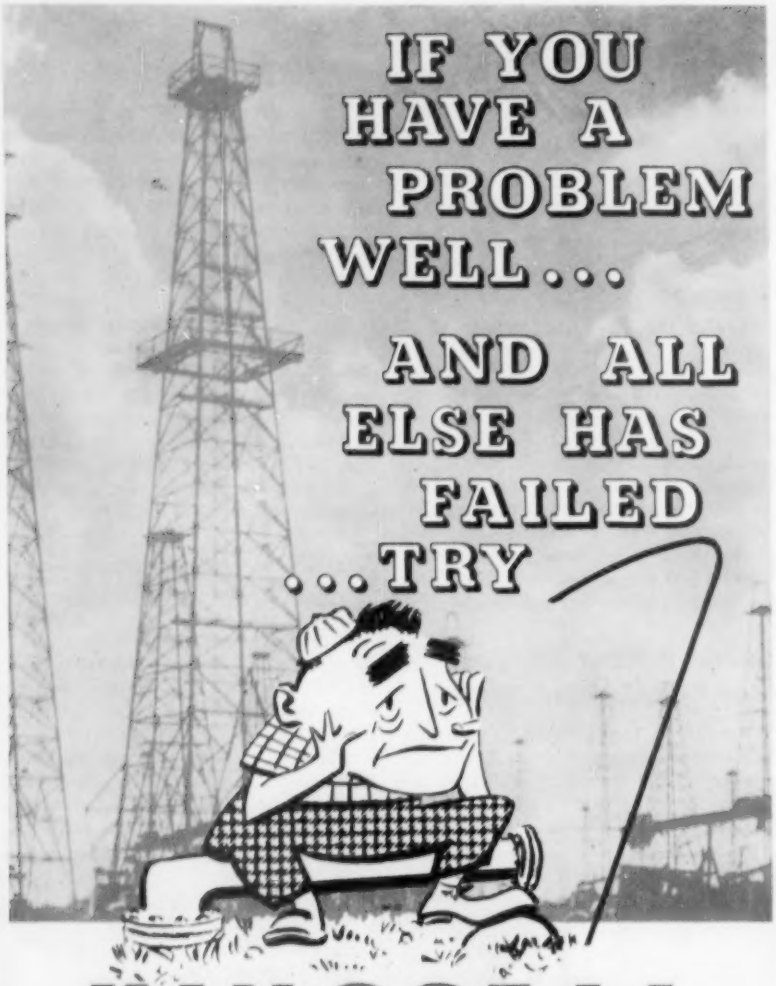

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Open-flow potential is 17,000,000 cu. ft. of gas daily from the upper sand, and 3,200,000 cu. ft. daily from the lower sand. Gas-distillate ratio is 66,000 cu. ft. per barrel from the lower, and 87,400 cu. ft. per barrel from the upper zone. Shut-in pressures are 1,516 psi. and 2,114 psi., respectively.

SOUTH LOUISIANA

Oil Production Opened on Texaco's Topsy Prospect

The Topsy prospect in the northwestern tip of Jefferson Davis Parish is proving productive with a discovery by The Texas Co. at its 1 Goodwin et al.

Testing first Frio sand, perforated at 6,114-25 ft., the new discovery well

Topsy area (indicated by arrow) in northwest tip of Jefferson Davis where first production has been opened by The Texas Co.

flowed 136 bbl. of 29.7°-gravity oil per day through 11/64-in. choke with pressure of 400 psi. and gas-oil ratio of 304 cu. ft. per barrel. No water was indicated.

Hole is plugged back from drilled depth of 8,505 ft.

Nearest production is 4 miles east in Indian Village field.

Frio Proves Productive In Sunset Area Wildcat

Columbian Carbon Co., Houston, is opening a new gas-condensate field in the south central part of St. Landry Parish. It is in the Sunset area, about 10 miles south of Opelousas, and about 15 miles north of Lafayette, in Lafayette Parish. It is 4 miles east of Shuteston field, nearest production.

Discovery well is at 1 Horaist, in 87-7s-4e. Production is from Frio sand. From perforations at 10,388-92 ft., the well, testing through various chokes, flowed at rates up to 240 bbl. of condensate with 3,000,000 cu. ft. of gas

Location (arrow) of Columbian Carbon Co.'s new gas-condensate discovery well in the Sunset area, southern St. Landry Parish.

per day. Additional tests will be made of higher intervals before the well is completed.

SOUTHWEST TEXAS

New Drilling to Confirm Atascosa Oil Discovery

Security Drilling Co. and F. Ewing are following up their new Navarro oil discovery 2 miles southwest of Pleasanton, in Atascosa County, with two confirmation tests.

Their discovery well, 1 Frank, in the William Moore Survey, is being completed from perforations at 4,637-64 ft. During swabbing tests, it produced at the rate of more than 200 bbl. of oil per day.

Confirmation tests are 2 and 3 Frank, the first 933 ft. southwest, and the other the same distance northeast of the discovery well.

McMullen Gets New Field

R. K. Taylor and L. E. Ethridge, Jr., have a new pumping discovery-well in southern McMullen County. It is their 1-B Hagist ranch, good for 55 bbl. of 23°-gravity oil per day. Completion is from Mirando sand in open hole at 2,006-09½ ft. Location, in H&TC Survey, is 22 miles south of Tilden. It opens T-E-A (Upper Mirando) field.

McMullen County Strike Opens New Wilcox Field

Open-flow tests at Bridwell Oil Co.'s new lower Wilcox discovery well, 5½ miles northwest of Calliham, McMullen County, indicate a potential productivity of 44,000,000 cu. ft. of distillate-bearing gas per day. Gas-liquid ratio is 50,000 cu. ft. per barrel.

The well, 11 Brownson, listed as the discovery well of O'Possum Creek field, was drilled to 6,610 ft. Gas-distillate completion is from perforations at 6,047-54 ft. Previously, in tests of perforations at 6,220-32 ft., the well flowed at the rate of 15 bbl. of oil per day.

The well is shut in with pressure of 2,305 psi. Gravity of the distillate is 63.8°.

EASTERN INTERIOR

ILLINOIS

Heavy Producer Completed In Half Moon Area

Skiles Oil Corp. has just completed the 1 Haines, a heavy producer in Wayne County, Illinois. This O'Hara well flowed 672 bbl. per day through a 3/16-in. choke. No acid has been used yet. Skiles owns nearly 400 acres around the new discovery which lies 1 mile east of old Half Moon pool, which has produced over 1,000,000 bbl. of oil in the last 10 years from 200 acres.

It is planned to drill two offsets to the 1 Haines immediately. The new well is reported to be one of the largest producers completed in Wayne County in recent years.

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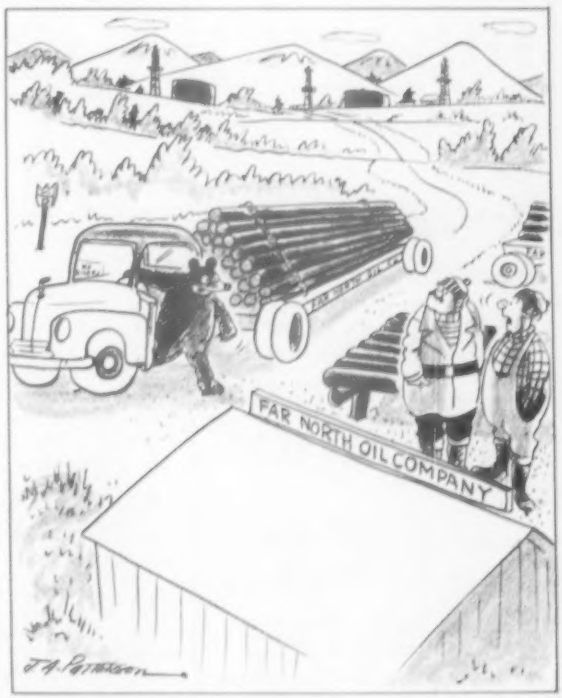

"What happened to Gus?"

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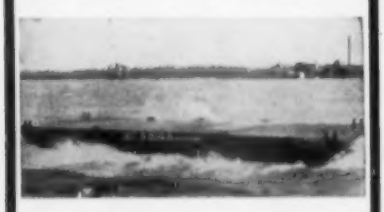
_ _____ is

"Tuffy Nuff"

SEE PAGE 117

FOR CHARTER STEEL BARGES



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Lucy Miller, NW NW SE 7-9s-10e, 4 miles north of Shawneetown, is on the pump testing the Aux Vases at 2,754-64 ft. The well swabbed 40 bbl. per day natural. It is 2 miles from other wells.

• In Christian County, 5 miles northwest of Taylorville, Lama Oil Co. 1 George H. Hibbard, NW NE SW 3-13n-3w, is flowing 16 bbl. of oil per hour, natural, from the Hardin sand at 1,782-1,803 ft. This is a daily rate of 384 bbl. on ¾-in. choke. The discovery is 3 miles from production.

• In Wayne County, 1 mile from production, Skiles Oil Corp. and Mt. Carmel Drilling Co. 1 Virginia Haines in NE SW NE 26-1s-9e, is completed for 205 bbl. per day flowing natural on 15/64-in. choke from the O'Hara at 3,281-98 ft.

WESTERN KENTUCKY

Fred W. Rowe Drilling Co. and J. E. Wickliffe have the largest gas well in Western Kentucky at their Mandy Lile well 15 miles southwest of Greenville on State Highway 189, Christian County. The wildcat is more than 3 miles from nearest gas production. It is producing from the upper Paint Creek at a depth of 732 ft. from an 8-in. hole. The well is down to 740 ft. and the pressure is hindering further drilling. The gas is throwing rocks the size of potatoes out of the hole and is still blowing wild, and attempts are still being made to cap it. The Western Kentucky Gas Co. went out to gage the well, and their gage was only calibrated to read 9,000 M.c.f. and the volume of the gas broke it. An official of the company said he estimated it to be making from 15 to 18 million cubic feet of gas daily.

This is at present the largest gas well in the Western Kentucky region. It is within 2 miles of a gas line. The Fred W. Rowe Drilling Co. has over 2,000 acres under lease in the immediate area, and is planning to do extensive testing in the very near future.

TENNESSEE

During May Shell Oil Co. moved a rotary rig into north-central Tennessee's shallow oil and gas area. The rig is drilling a deep wildcat near Craborchard in Cumberland County, on a large block of acreage leased by Shell. Since Shell began drilling eastern interest bought on the Cumberland Plateau—in ten counties—324,000 acres in fee.

Magnolia Petroleum Co. has several tracts leased in this area of the state. Buttram Petroleum Corp. who has several structures in this field (Putman County), is interested in securing a large block or blocks of acreage in the region in addition to what it now has.

APPALACHIAN

PENNSYLVANIA

In Parker Township, Butler County, Southwest Pennsylvania, Walker et al completed 1 John Walker, rank wildcat, resulting in a dry hole, Oriskany sand 5,464 ft., Selina 5,630 ft., gas pocket 6,210 ft., Medina 7,210 ft., Total depth 7,620 ft.

• Unity Township, Westmoreland County, Peoples Natural Gas Co. 2-4037 Fred Musnug was nonproductive and resulted in salt water in the Oriskany sand topped at 8,740 ft., water 8,766 ft., total depth 8,773 ft.

WEST VIRGINIA

Dry Fork district, Randolph County, West Virginia, Columbian Carbon Co. 1-1208 D. H. Hill Arnold, elevation 3,155 ft., gaged 697,000 cu. ft. gas, chert 4,682 ft., show gas 4,753 ft., Oriskany sand 4,828 ft., gas 4,838 ft., total depth 4,846 ft.

EASTERN KENTUCKY

In the Pike County sector of Big Sandy gas field, Kentucky West Virginia Gas Co. has completed 6,250 M. D. L. Greer as a good gas producer from the Mississippian Big lime. Test topped the lime at 2,540 ft. and penetrated same to a total depth of 2,791 ft. A natural open flow of 1,917,000 cu. ft. of gas per day was recorded with a rock pressure of 210 lb. in 16 hours.

OHIO

A semiwildcat south of the old Flint Ridge pool in Hopewell Township, Muskingum County, resulted in a 240 bbl. initial producer. The test, Bumgard & Coury 1 Elsie Carson, Section 15, ½ mile from production and with a dry hole intervening, found the Clinton at 3,254-68 ft. and 3,282-3,306 ft. with 600 ft. oil before fracture treatment. North of the same pool, a further extension was made to the north by Oxford Oil 6 Crown, 3rd Qr., Licking Township. Clinton at 3,154-3,207 ft. made 325,000 cu. ft. and a show of oil natural and 800,000 cu. ft. and 18 bbl. in 24 hours after fracturing.

• Drilling in Second Berea field is showing no abatement. There are now 26 rigs running in the area with 10 concentrated in Bedford and Scipio townships, Meigs County.

A west extension to Greer pool in Jefferson Township, Knox County, found an oil pay at 2,743-55 ft. and 1,510,000 cu. ft. gas at 2,768-75 ft., and was tubed natural. The gasser was on 1 Ford Wright in Section 1.

• Mount Zion pool in Jackson Township, Knox County, was extended

into Clay Township by the National Gas 1 (2) W. G. Dugan, Section 21. Clinton at 2,745-85 ft. showed 5 bbl. natural and 156 bbl. in a 12-hour test after fracturing.

● A short extension to the pool at West Carlisle in Pike Township, Coshocton County, was completed by Allen Willey et al. on 3 Herbert Anderson, Section 3. Clinton sand at 3,188-3,241 ft. had 500 ft. oil in 9 hours natural and 150 bbl. in 24 hours after treatment.

PACIFIC COAST

CALIFORNIA

New 6,600-ft. Pool For Tejon Ranch

Tejon field on the south end of San Joaquin Valley is beginning to take on proportions of Edison field, 20 miles north, insofar as range of producing sands is concerned. Until 13 months ago Tejon pays were confined to those of the upper Miocene series. Since then addition of the Olcese, Jewett, and Freeman zones of middle and lower Miocene age has increased the number of productive zones to seven.

Most recent discovery was the Freeman pay, which Ridge Hill Oil Co. 12 Schoettler opened from 6,557-95 ft. On initial tests it pumped 200 bbl. of 34.5° crude. Location of the test is in SW NW 34-11n-19w, just south of Olcese and Jewett production.

A wildcat 2 miles northwest of this activity has indicated it might be successful. C. F. Wehr 63-20 Butler-Wehr on a formation test at 6,620-6,744 ft. yielded a 900 ft. rise, of which 700 ft. was gassy mud and 200 ft. was 31°-gravity crude. Gas blow was estimated at the rate of 200 M.c.f. daily. Production was believed to be from the Pulv. zone, upper Miocene, which is found at a depth of about 4,450 ft. in the field.

New Deep Strand Tests

A wildcat about 3½ miles northwest of the recent Shell Oil Co. deeper-zone discovery at Strand, 15 miles west of Bakersfield, is being planned by Porter Sesnon and Continental Oil Co. The 12,500-ft. test is slated for NE 28-29s-25e.

The Shell discovery was in Vedder (lower Miocene) sands at 12,360-12,410. As the find is believed to be of better-than-average importance, the Sesnon test will be closely watched. Shell was preparing 73X Shell-Ohio-K.C.L. as a south offset in SE NE 12-30s-25e.

Saxon Test Near Bottom

General Petroleum Corp.'s deep wildcat in the Saxon area of Yolo County was coring below 13,100 ft. and was believed to be nearing total depth. Located in NW SE 10-7n-3e, 65-10 Glide-Court is slightly over ½ mile east of Sacramento Valley's deepest wildcat. Last year General Petroleum drilled 1 Glide-Court to 13,321 ft. without success.

Oxnard Search Planned

Richfield Oil Corp. has started an extensive leasing campaign in the Oxnard area of Ventura County. Included in its sights are more than 5,000 leases on the 2,000 acres within Oxnard's city limits. In the past 2 years Standard Oil Co. of California has opened three high-gravity deeper pools in the old low-gravity field 1½ miles east of Oxnard. Productive limits of the West Montalvo field have been extended eastward toward Oxnard.

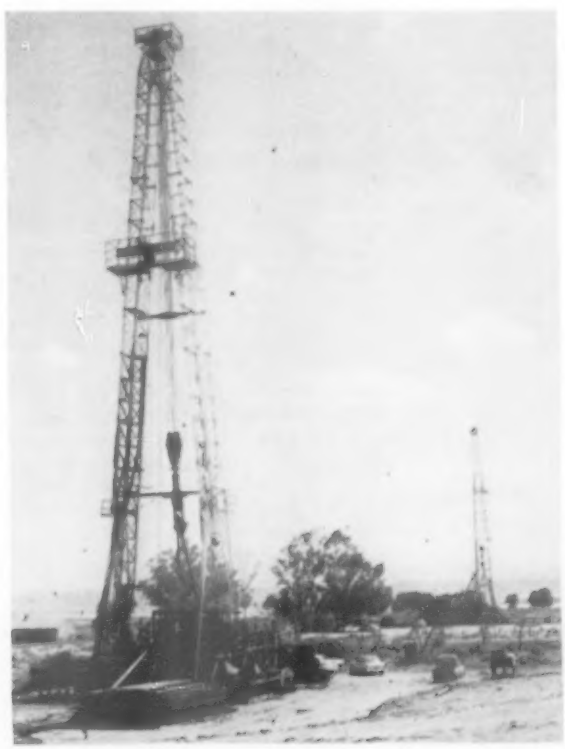
Two deep tests being closely watched in this area are those of Sunray Mid-Continent Oil Co. and E. L. Doheny, Oper. At the former's 1 Sunray-Ohio-Del Cielo in NE 31-2n-22w, about 2 miles northwest of Oxnard, 7-in. pipe was being run to 14,025 ft. The Doheny test, 1 Richfield-Laubaucher, also was in process of being completed after hole had been plugged back to 12,250 ft. from 14,001 ft. It is in NW Section 5, about 1 mile southeast of the Sunray test.

GREAT LAKES

MICHIGAN

First tests of possible Richfield oil pay showed mostly all water at Gordon Drilling Co. 1-A Bell, SW NW SE 2-17n-2w, Beaverton Township, Gladwin County, original Richfield test well in the older Beaverton-Dundee oil pool. The 1-A Bell was reported to have shown favorably in the Richfield on the basis of core analysis but after porosity zones at 5,026-32 and 5,038-44 ft. were perforated with a total of 72 shots, hole showed for 1,700 ft. of water and 20 ft. of oil in 36 hours. Perforations were squeeze-cemented off and operator planned to reperforate between 5,038-44 ft. Hole was drilled to 5,225 ft., Richfield objective total depth.

● Further testing appeared to confirm earlier reports that a new Dundee-Reed City zone oil discovery well was in prospect at the Anderson & Crawford 1 Eickenroth & Lean, SE SE SW 28-12n-9w, Winfield Township, Montcalm County. Following a 500-gal. acidization to pay between 3,350 ft. and the total depth, 3,353 ft., well swabbed and flowed 40 bbl. of net oil in 8 hours; 45 bbl. of oil during next 8-hour test; and about 60 bbl. of oil in 21 hours



Los Nietos Co., Oper. 45-1 Bourdieu, a southwest edge well in the Polvadero area of Guijarral Hills field, was drilling below 6,200 ft. toward the 10,500-ft. Eocene sand. The rig is one of Santa Maria Drilling Co.

on another test later this week. Additional testing was in progress.

● First Dundee oil test in Ensley-Traverse oil pool, Newaygo County, failed to log oil pay in top 15 ft., although structurally high, and next best appeared to be the 100-ft., so-called Reed City zone. This test well, the Ace Oil Co. A-1 Butler, SW NE SE 7-11n-11w, logged Dundee top at 2,863 ft. Drilling was in progress, with no shows, below 2,878 ft.

WESTERN CANADA

ALBERTA

Light Gravity Discovery Made in Usona Area

The California Standard Co. has made a discovery of light gravity crude oil at its Usona area wildcat, 22 miles northwest of Lacombe. This discovery

The California Standard Co. has a light-gravity oil discovery 22 miles northwest of Lacombe in central Alberta. Production is indicated in the Green shale formation.

well, Cal-Standard 2-8 Fairybank, hit in the Green shale formation, a relatively unknown oil pay in Canada, on recent drill-stem tests.

The new strike, 2-8 Fairybank, is on LSD 2, 8-44-27w4, 9½ miles northeast of the nearest oil production in the Homeglen area, and 10½ miles northeast of Texaco's A-1 Ponoka gas strike. During tests in the Green shale at about 7,180 ft. large oil recoveries, up to 5,000 ft. of clean oil, were recorded.

Three Bow Island Pays Found at Eyremore Test

A wildcat being drilled by Anglo-Canadian Oils, Ltd., in the Eyremore area of southern Alberta found gas flows in three separate Bow Island formations and is currently being carried on to its main objective in the Madison.

The well, Anglo-Canadian et al 30-10 Eyremore, LSD 10, 30-17-18w4, is 22 miles south of Bassano town and 75 miles southeast of Calgary. It is being backed in addition to Anglo-Canadian, by the Calgary & Edmonton Corp. and Security Freehold Petroleums, Ltd.

The first two Bow Island sands flowed gas at rates of 1 and 1.7 million cubic feet, respectively. The test of the third Bow Island sand, bottomed at 3,390 ft., rated a flow of 2,500 M.c.f. per day.

Triassic Showings Reported At Test Well in Sturgeon Lake

Shell Oil Co. has found encouraging showings of oil in the Triassic at a D3 test well in Sturgeon Lake-Devonian oil field, on LSD 7, 12-69-22w5. The well is in the main development sector of the field.

The strike, Shell SB 7-12 South Sturgeon Lake, found its showings at about 4,940 ft. in the Triassic. Oil was recovered on two successive tests up to 130 ft. of clean crude. Crew drilled ahead to 5,230 ft. and were preparing for more tests.

SASKATCHEWAN

Viking Gas Discovered At Craiglands Wildcat

The team of Husky Oil & Refining Co., Ltd., and Phillips Petroleum Co. has discovered gas in the Viking sand at the Craiglands area wildcat in southwestern Saskatchewan.

The discovery well, Phillips-Husky 1 Warrior, is 8 miles southeast of Craiglands town, 7 miles west of the Eatonia area gas field, and 23 miles south of Viking oil production at Smiley-Dewar.

The 1 Warrior wildcat, LSD 11, 9-27-25w3, flowed gas at rates between 1,500 and 2,000 M.c.f. per day in the Viking sand on test bottomed at 2,574 ft. Total depth is 3,269 ft. and production casing is set. A service rig is moving in to evaluate the discovery.

ROCKY MOUNTAIN

WYOMING

New Pay Tested at Natrona County Confirmation

Houston Oil Co. has tested an apparent new pay zone on the Clark Ranch Unit, Natrona County. The operator recovered 1,150 ft. of clean oil in 1½ hours at 2 Unit, C NW SW 6-35n-84w. Tops have not been released. The test at 3,178-3,253 ft. was unofficially reported in Sundance. Recovery also included 150 ft. of mud. Pressures were not reported.

The well is ¼ mile southwest of this operator's recent Tensleep discovery on the unit, and is scheduled as a confirmation of that discovery. The first test of the unit swabbed 80 bbl. of oil per day from Tensleep, and pump is now being installed.

Denver-Julesburg Basin Wildcat Finds J Sand Oil

Charles C. Gross, Jr., has recovered oil on drill-stem test of J sand at a wildcat in the Pine Bluffs area of Laramie County. The well is 1 Gross-Wilkerson, NE NE SE 17-14s-60w. Test at 7,357-75 ft. recovered 240 ft. of oil, 330 ft. of heavily oil-cut mud and 60 ft. of oil and water-cut mud in 75 minutes. Flowing pressure reached 220 psi. at the end of the test. A total of 12 ft. of saturated sand, bleeding oil from fractures was reported in core 7,367-7,417 ft.

The well is a little more than 1 mile west of the town of Pine Bluffs and is 2½ miles northeast of a 1952 discovery in this area which has since ceased commercial production. Nearest production in Nebraska is 12 miles to the southeast.

The southeastern corner of Wyoming has had relatively little exploration during the development of the Denver-Julesburg basin in Colorado and western Nebraska. Extension of production westward in Nebraska, plus a 1955 discovery to the north in Goshen County has increased interest in the Wyoming portion of the basin.

Completion Near at Second Pinedale Wildcat

El Paso Natural Gas Co., Continental Oil Co. and Malco Refineries Corp. have landed pipe in a second wildcat on the big Pinedale structure in Sublette County. The well is 2 Pinedale Unit, N½ SW SE 29-31n-108w. Total depth is 10,685 ft., with pipe set at 10,314 ft. The well is to be perforated in several intervals, but operators have released no data.

A Ft. Union gas discovery was completed within the 90,000-acre unit earlier this year. A third wildcat in the unit by these operators is also drilling below 10,000 ft.

Shallow Gas Show Tested In Tip Top Area

General Petroleum Corp. reported a flow of gas at the rate of 88,000 cu. ft. per day on drill-stem test of Almy at 65-18 Unit, NE NW SE 18-28n-

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113w, Sublette County. The well is 1 mile west of the shallow Tip Top gas field, where Almy is a productive zone. The present well is scheduled to test Frontier, with objective depth not reported by the operator.

MONTANA

New Disturbed Belt Location Staked

Union Oil Co. of California has made location for a new wildcat in the Disturbed Belt of northwest-central Montana. The company will drill 1 Mittens, C NE NW 12-29n-11w, in the Heart Butte area of Pondera County. It is to test Madison at about 8,500 ft. The location is 11 miles southeast of this operator's possible discovery in the East Glacier Park area, Glacier County.

The latter well recovered gas on drill-stem test of Madison. A total of 400 ft. of Madison section has been cored, according to unofficial reports, with shows reported throughout the section. The operator is coring below 9,411 ft. with intermediate string set.

Fallon County Discovery Finds Ordovician Shows

Shell Oil Co. recovered 270 ft. of oil mud on drill-stem test at 8,437-8,535 ft. at 22-X-36 State, SE SE NW 36-8n-59e, in the Pennel area of Fallon County. Test was in Red River, with tool open 3 hours. Another test at 8,663-8,740 ft. recovered 120 ft. of gas and oil-cut mud and 550 ft. of gas and mud-cut oil. The operator is drilling below 8,750 ft.

The well is on the Cedar Creek anticline, and has already been established as an apparently commercial discovery in Mission Canyon and in an unidentified zone in lower Mississippian.

New Williston Basin Wildcats Located

Three new wildcats have been staked in the Montana portion of the Williston basin. Stanolind Oil & Gas Co. has made location for 1 NP-F, C NW NE 29-18n-43e, in the Timber Creek area of Garfield County. There has been no previous drilling in the area, which is 40 miles southwest of Southwest Richey pool.

Amerada Petroleum Corp. has made location for a Valley County wildcat, 1 Belzar, NE SE 29-29n-40e.

Richfield Oil Co. has made location for a test of Madison at 1 Buck Elk, SE NW 7-29n-51e, in the East Poplar area, Roosevelt County. The well is 1 mile north of production in East Poplar field.

NORTH DAKOTA

Casing Landed at Apparent Bottineau County Discovery

Lion Oil Co. has landed casing at 1 Skarphol, C SE NW 33-164n-77w, Bottineau County, and was preparing to run tubing at last report. The wildcat, 7 miles east of production in Northeast Landa field made commercial quantities of oil on drill-stem tests of Mission Canyon. Pipe was set at 3,012 ft., and total depth is 3,018 ft.

Deep Test in Stark County Abandoned

Hunt Oil Co. has abandoned 1 Privratsky, NW NW 15-138n-98w, in the Belcourt area of Stark County. Total depth was 12,154 ft., with top of Silurian logged at 11,220 ft. There were no shows of importance.

NEBRASKA

Garden County Wildcat Flows Gas on Test

Baumgartner Oil Co. of Denver recovered gas on test of D sand at a wildcat 4 miles east of the town of Oshkosh, in Garden County. The well is 1 Kaschke, SW NE SW 26-17n-13w. Test was of the interval 3,307-12 ft. in D sand. Tool was open 1½ hours, with gas at the rate of 700,000 cu. ft. per day after 4 minutes. Pipe recovery was 50 ft. of very heavily oil-cut mud, and 80 ft. of salty water. While commercial possibilities of the wildcat remain in doubt, the show was much better than previous scattered shows through the sparsely drilled county. A dry hole immediately southwest of the Baumgartner wildcat is the only previous drilling done in the township.

COLORADO

Bent County Discovery to Complete from Two Zones

M. J. Stansbury will attempt dual completion at his apparent discvorey northeast of Las Animas in Bent County. The wildcat, 1 Cordes & Oberlander, C SW SW 21-21s-51w, has been responsible for new leasing interest now evident in southeastern Colorado. It was tested for a flow of 2,000,000 cu. ft. of gas per day from the Atoka (Pennsylvanian). Further testing in a deeper, and as yet unidentified zone at 5,208-27 ft. This interval flowed at rates varying from 700,000 to 1,800,000 cu. ft. per day following mud

acid. Test of the Atoka also recovered 210 ft. of 36°-gravity oil.

UTAH

Wildcat Abandoned At White Mesa

Shell Oil Co. has abandoned 1 White Mesa, C NW NW 6-43s-24e, San Juan County. The well had been reported as a possible discovery in Paradox (Pennsylvanian) but continued tests recovered decreasing amounts of oil, while water recovery rose. The wildcat is east of Shell's North Boundary Butte discovery, and south of the firm's 1954 discovery at Desert Creek.

Successful Wildcats

SOUTHWEST TEXAS

Duval County: Sunray Mid-Continent Oil Co. 1 Ramon, Jose Antonio Gonzales Grant, A-227. IPP 84 BOPD (net) with 20 per cent water, 26°, perforated 3,100-18 ft. and 3,129-34 ft. TD 6,500 ft. (New field.)

TEXAS GULF COAST

Calhoun County: Rock Hill Oil Co. 1 Stutzenbecker, Valentine Garcia Sur., A-17. IP 4,900 M.c.f. daily, open-flow potential, 12 BC per M.M.c.f., perforations 5,278-90 ft. (New field.)

Colorado County: Lloyd H. Smith, Inc., and The Texas Co. 1 Sweiger, T. J. Smith Sur., A-500. IP 12,000 M.c.f. daily, open-flow potential, spray condensate, 50°, perforated 8,548-76 ft. TD 10,523 ft. (New field—2 miles north of Sheridan field.)

Hardin County: Sinclair Oil & Gas Co. 3 H&TC fee, Sec. 197, H&TC Sur., A-302. IP 140.67 BOPD, ⅛-in., 39.1°, Yegua 6,072-76 ft. (perforations). TD 7,400 ft. (New pay in Fortenberry field.)

Matagorda County: Skelly Oil Co. 4 Savage, Maria Cummins Sur., A-22. IP 59 BOPD, 3/32-in., 41.6°, perforations 8,921-25 ft. TD 12,328 ft. (Second well, and new pay in Summins field.)

EAST TEXAS

Cass County: Sam Sklar 1 Williams, Briant Holmes Sur., A-447, 8½ mi. SE Atlanta, ¾ mi. NW Rodessa field. IP 168 BOPD, ¼-in., 42°, TP 300 psi., Hill sand 5,932-50 ft. TD 6,140 ft.

WEST CENTRAL TEXAS

Fisher County: Allison & Prestridge 1 Young, 5-23-T&P, 2 miles SW Bernecker. IP 162 BOPD, 20/64-in., 37°, TP 75 psi., GOR 850, Strawn reef perforated 6,767-79 ft. TD 6,856 ft.

Haskell County: Pontiac Refining Corp. et al 1 Hughes & Shelton, M. Trevieso Sur. 38, A-387, 10 mi. NE Stamford. IP 127 BOPD, 10/64-in., 40°, GOR 123, TP 200 psi., Palo Pinto 3,294-98 ft. TD 3,305 ft.

Taylor County: Humble Oil & Refining Co. 1-B NT-TXL, 17-4-T&P, 6½ mi. SW View. IP 113 BOPD, ¼-in., 41°, TP 35 psi., GOR 133, Cisco reef 3,014-50 ft. TD 3,560 ft.

Katz & Venable 1 Russell, 20-1-SPRR, 2 mi. N Tuscola. IP 248 BOPD, 16/64-in., 41°, GOR 288, Flippen sand 2,132-38 ft. TD 2,255 ft.

NORTH TEXAS

Archer County: Nortex Oil & Gas Corp. 1-A Ordener, 118-4-Clark & Plumb, 3½ mi. NW Windthorst. IP 392 BOPD, 16/64-in., TP 275 psi., 42°, GOR 700, Caddo 5,158-68 ft. TD 5,210 ft.

Grayson County: Standard Oil Co. of Texas 2 McKeon, Alfred Humes Sur., A-522, 2 mi. NW Sherman. IP 281 BOPD, 18/64-in., 39°, TP 600 psi., GOR 1,000, Cordell sand 8,961-80 ft. TD 9,079 ft.

Wise County: Byrd Oil Corp. 1-A Pearson, D. Mangum Sur., 2 mi. S Cottondale, 1½ mi. E production. IP 1,939 M.c.f. gas, 16/64-in., CP 1,310 psi., pay 5,908 ft. TD 5,912 ft.

H. Curtis Plumly, Jr. 1 Lawrence, W. M. Hersee Sur., A-411, 1½ mi. N Chico, 1 mi. W Bend conglomerate production. Flowed 75 bbl. oil in 6 hours, ⅝-in., TP 200 psi., 41°, GOR 200, calculated IP 300 BOPD. TD 4,343 ft.

Young County: McMahon & Bullington Drilling Co. 1 Lennington, Blk. 6, G&BN Sur., 1 mi. NE Farmer. IP 188 BOPD, ¼-in., 40°, GOR 300, TP 150 psi., Strawn 3,287-3,321 ft. TD 3,401 ft.

Louis Pitcock & Kenneth Rich 1 Burch, Sec. 3411, TE&L Sur., 6½ mi. NW Graham. IP 264 BOPD, 16/64-in., TP 300 psi., GOR 350, 40°, pay 3,870-90 ft. TD 3,909 ft.

Alan T. Strong 1-B Criswell, W. J. Gilmore Sur., A-1730, 5 mi. SE Graham. IP 364 BOPD, 16/64-in., 41°, TP 400 psi., "T" zone 3,308-27 ft. TD 3,366 ft.

WEST TEXAS

Andrews County: Cabot Carbon Co. 7 Bertha Nolley, 8-314-Gaines CSL, 15 miles NE Andrews. IP 220 BOPD, 24/64-in., TP 180 psi., 30.7°, GOR 473, pay 4,490-4,522 ft. TD 4,522 ft.

Scurry County: Sun Oil Co. 1-D Shannon, 331-97-H&TC, 11 mi. NW Synder. IP 522 BOPD, 12/64-in., 40.5°, TP 875 psi., GOR 417. Ellenburger pay 8,117-49 ft. TD 8,154 ft., ground elev. 2,505 ft.

Ward County: Chambers & Kennedy 1 Creedon, 209-34-H&TC, 5 mi. N Barstow. IP 142 BOPD, ¾-in., 39°, TP 100-225 psi., GOR 506, Delaware sand 4,729-41 ft. TD 4,935 ft.

ILLINOIS

Edwards County: Cullum & Lawhead 1 Horn, NE NW SE 20-2s-10e. IPP 180 BOPD, Aux Vases 3,181-3,204 ft. TD 3,348 ft. (1⅛-mile extension to Ellery Consolidated pool).

WEST VIRGINIA

Randolph County, Dry Fork district: Columbian Carbon Co. 1-1208 D. H. Hill Arnold, elevation 3,155 ft., 697,000 cu. ft. gas, chert 4,682-4,780 ft., show of gas 4,753 ft., Oriskany sand 4,828 ft., gas 4,838 ft. TD 4,846 ft.

ARKANSAS

Sebastian County: Gragg Pipeline Co. and Reynolds Mining Corp. 1 Boyde, C SE SE NW 29-6n-30w, 3½ miles southeast of Greenwood. IP 2,500 M.c.f. of gas per day, Atoka sand 4,112-23 ft. TD 5,115 ft. (Gas discovery.)

OKLAHOMA

Grant County: Calvert Drilling Co. 1 Feist, 4 miles east of Southeast Eureka Bartlesville pool in SE SE 11-28n-8w. IPF 11,900 M.c.f. of gas per day plus some distillate from the Bartlesville sand at 4,804-22 ft. TD 4,940 ft. (Gas discovery).

MISSISSIPPI

Hinds County: Walter E. Sistrunk 1-A H. T. Shuff Unit, NW SE SE 27-5n-3w. IPP 7 BOPD (net), 5 BWPD, 37°, Wilcox 2,400-04 ft. (perforations). TD 2,432 ft. Elev. 212 ft., top Wilcox 2,183 ft. (Oil-discovery well Oakley salt dome.)

Jefferson County: John S. Callon 1 Valentine, 65-8n-1w. IP 112 BOPD, 9/64-in., 30°, Wilcox 4,057-59 ft. (perforations). TD 6,495 ft. Elev. 160 ft., top Wilcox 3,722 ft., base big shale 5,092 ft., Artman 5,445 ft. (Discovery well North Sunnyside field.)

Calto Oil Co. and G. W. Gulmon 1-B Guidon, 23-9n-2w. IPP 50 BOPD (net), 25 per cent water, 39.9°, Wilcox 5,395-98 ft. (perforations). TD 5,526 ft. Elev. 120 ft., Wilcox 3,663 ft. (Discovery well North Church Hill field.)

KANSAS

Graham County: Francis Oil & Gas Co. 1 Keith, NE NE SW 32-8s-24w. IPP 206 BOPD, Lansing 3,906-11 ft., 40°. TD 3,970 ft. (Discovery well of Northwest Holley pool).

NEBRASKA

Cheyenne County, Davisson: British-American Oil Producing Co. 1 Davisson, C SW SW 35-17n-51w. IPP 163 BOPD, J sand discovery, new field. TD 5,135 ft. J sand.

NORTH DAKOTA

Williams County: Amerada Petroleum Corp. 1 E. Wolff estate, C NW NE 5-154n-95w. IPF 49 BOPD, Madison discovery, new field. TD 8,472 ft. Madison.

CALIFORNIA

Fresno County: Los Nietos Co., Oper. 65-1 Bourdieu, NW SE 1-21s-16e, IPP 393 BOPD, 33° gravity, 66 M.c.f. gas, perfs. 8,380-8,447 ft., TD 8,450 ft. (New Sanger sand, lower Miocene, pool in Polvadero area of Guijarral Hills field.)

Kern County: Ridge Hill Oil Co. 12 Schoettler, SW NW 34-11n-19w, IPP 200 BOPD, 35° gravity, perfs. 6,557-95 ft., TD 7,150 ft. (New pay, Freeman sand of middle Miocene age, in Grapevine area of Tejon field.)

Shell Oil Co. 63X-18 A.M.I., SE NE 18-30s-21e, IPF 800 M.c.f. gas, 16/64-in. choke, 575 psi. tubing pressure, perfs. 2,568-2,808 ft., TD 3,493 ft., plugged 2,830 ft. (New gas discovery in Belgian Anticline field.)

MONTANA

Glacier County: Kuhlberg & Otthouse, Inc., 1 Vasboe, C NW NW 35-37n-5w. IPF 90 BOPD. TD 2,749 ft. Madison.

COLORADO

Adams County: Lion Oil Co. 1 Coordes, C SW SW 7-1s-57w. IPF 234 BOPD, "D" sand oil discovery, new field. TD 6,032 ft. "J" sand.

Phillips County: Stanolind Oil & Gas Co. 1 Scott, C NW SE 31-9n-47w. IP 506 M.c.f. of gas per day, "J" sand discovery, new field. TD 4,064 ft. "J" sand.

Morgan County: Superior Oil Co. 84-20 Tomky, SE SE NE 20-2n-55w. IPP 158 BOPD, D sand discovery, new field. TD 5,895 ft. J sand.

Weld County: Utah Southern 1 Grabill, C NW SE 29-9n-56w. IP shut in gas well. J sand gas discovery, new field. TD 5,895 ft. J sand.

SASKATCHEWAN

Phillips-Husky 1 Warrior, LSD 11, 9-27-25w3. Viking gas well. TD 3,269 ft.

PERSONALS

New Chairman

Brewster Jennings elected to top Socony Mobil post

BREWSTER JENNINGS, who last week moved up to chairman of the board of Socony Mobil Oil Co., has never quite been able to separate the salt water and the oil in his background. In fact, there is no indication that he has made an attempt to do so.

Jennings, with a long oil heritage behind him, took his first active job in the industry as a clerk in the marine department of the old Standard Oil Co. of New York shortly after he left Yale University in 1920. For years afterward he was a transportation man. He is still a sailor and sailing is one of his hobby pastimes.

President of the company since 1944, Jennings last week became chairman succeeding George V. Holton, who retired July 1. The new board chairman, however, is still the chief executive officer of Socony Mobil. He retains the chairmanship of the firm's executive committee, a position he held as president.

The salt water in the unassuming Jennings' blood is liberally laced with oil and it was only natural for him to land a job with Standard Oil as he did. His two grandfathers, Benjamin Brewster and Oliver B. Jennings, were financial backers of John D. Rockefeller and helped the latter run Standard Oil in the days of its inception.

Both those grandfathers were clerks in the Browning King clothing chain in Manhattan when the gold rush of '49 came along. Both went west and there they started the Jennings & Brewster clothing store in San Francisco. With the $150,000 each received when the business was sold in 1862, the two men backed Rockefeller.

The new Socony Mobil chairman has long been known as "a rich man's son who made good in spite of it."

He was an undergraduate at Yale in 1917 when World War I halted his education temporarily. He served as an ensign on a sub chaser and then returned to Yale in 1919.

After a stint as clerk in the marine department, Jennings became purchasing agent and later manager of real estate for the company. In 1935 he was named assistant to the president of Socony-Vacuum Oil Co., John A. Brown, and in 1939 was elected to the board of directors and placed in charge of transportation for the company.

Jennings left his firm in 1942 to become assistant deputy administrator of tanker operations in the War Shipping Administration and served in that capacity until 1944 when he returned to Socony-Vacuum as a director and resumed his duties in charge of transportation for the firm. He was named president in September 1944, just a month after his return to civilian pursuits.

Married and the father of three children, Jennings lives in Glen Head, Long Island, where woodworking shares his spare time with sailing. He's just as good at woodworking as he is at sailing, his associates say.

On one occasion, he discovered that the gavel used by Holton in presiding at the board meetings was missing. Jennings turned Holton a new gavel from an old table leg.

Albert L. Nickerson, vice president and director in charge of foreign trade of Socony Mobil Oil Co., Inc., has been elected president, succeeding **B. Brewster Jennings,** who has been made chairman of the board of directors *(see above)*. Jennings succeeds **George V. Holton,** who has retired as chairman. **Austin T. Foster** and **Paul V. Keyser, Jr.,** have been named directors. Foster is general counsel for the company. Keyser becomes vice president and director in charge of foreign trade.

Alfons Landa has been elected chairman of Reiter-Foster Oil Corp., New York, and **John H. Van Kirk,** president of North European Oil Corp., has succeeded **L. F. Brown** as president. Other officers elected are **Joe H. Dawson,** vice president in charge of operations; **Robert J. Farris,** vice president and treasurer; and **August Russ-Openheim,** president of Anemostat Corp. of America, secretary. The new directors are Landa, Van Kirk, Russ - Openheim, **Henry Offerman** of J. W. Sparks & Co., **Jesse A. True,** president of Sterling Oil Co. of Oklahoma, and **Harry D. Miller,** partner of Nugent & Igoe.

W. F. DAVIS

W. F. Davis has been elected vice president and general manager of Interstate Oil Pipe Line Co. to succeed **Bruce Ramsey.** Davis, a director of the company, had been assistant general manager for 2 years. Ramsey, also a director, has been appointed operations consultant to the president. **J. M. Bradley,** a director and former northern division manager, has been named assistant general manager responsible for Interstate's engineering, material-traffic, and oil-movements departments. **S. A. Sheppard,** acting general superintendent, has been named general superintendent of the company's crude-oil pipeline operations.

William C. Calhoun has been appointed administrative assistant to the manager of Continental Oil Co.'s petrochemical department in Houston.

T. A. BURTIS

Theodore A. Burtis, formerly supervisor of process engineering for Houdry Process Corp., Philadelphia, has become associate manager of research and development at Houdry's Linwood, Pa., laboratories. **Julius J. Cicalese,** senior process engineer, succeeds Burtis as supervisor of process engineering. **Josef W. Schall,** director of development at Houdry since 1952, has been named assistant manager of marketing in the corporation's chemicals division, and **George W. Higginson,** assistant manager of catalyst manufacture at Paulsboro, N. J., has been appointed assistant manager of manufacturing in the chemicals division.

Harry Levin, The Texas Co., supervisor of the analytical and testing department of Beacon laboratories, Beacon, N. Y., has been promoted to assistant to the manager of the research division. He has been succeeded as su-

PERSONALS

pervisor by **F. M. Roberts,** formerly assistant supervisor. **B. Y. McCarty,** Chicago regional manager of the technical services division, has succeeded **Claude Emmons** as Los Angeles regional manager. Emmons has retired. **J. E. Rusnell,** technologist in the technical services division in Chicago, has succeeded McCarty as regional manager.

Armstrong A. Stambaugh has retired as chairman of the board of Standard Oil Co. (Ohio). Stambaugh, a nationally recognized authority on petroleum marketing, will remain a member of the board of directors and will serve in a consulting capacity. The office of chairman will not be filled at this time.

S. H. Hastings has been promoted to research specialist in the research and development division of Humble Oil & Refining Co.'s Baytown, Tex., refinery. He will specialize in physical analytical methods with particular emphasis on higher boiling petroleum fractions. **J. C. Weisinger** has been advanced to mechanical engineer in the design department of the engineering division at the Baytown refinery.

H. G. MARINER

H. G. Mariner has succeeded **C. M. Scott, Jr.,** as general manager of Service Pipe Line Co., Tulsa. Mariner joined Service in 1940 as a draftsman and instrument man and served in engineering and managerial capacities for the company in the ensuing years. Prior to this appointment, Mariner held the posts of maintenance superintendent and assistant to the general manager in Tulsa. Scott, a director of the company, retired recently after almost 39 years of service. He had been general manager since 1951.

Joseph R. Burdette, mechanical engineer with American Oil Pipe Line Co., Houston, has been promoted to West Texas division engineer, with headquarters at Snyder.

R. E. Hayward has been appointed Oklahoma City area exploration manager of Gulf Oil Corp. **W. J. Lang** has assumed the duties of staff geologist in Gulf's Tulsa office. **E. L. Herbaly** has been appointed zone geologist of the Oklahoma City zone, and **R. W. Maxwell** has been named area geologist at Ardmore, Okla.

George S. Corey has replaced **M. S. Metz** as exploration manager for Shell Oil Co.'s Midland, Tex., area. Corey had been division exploration manager at Midland since 1952.

R. L. ARGUS

JOHN M. BROWN

R. L. Argus, formerly superintendent of construction and maintenance at Pan-Am Southern Corp.'s Destrehan, La., refinery, has been appointed assistant manager of the plant. **John M. Brown,** assistant manager of operations at Pan-Am's El Dorado, Ark., refinery, has been named assistant manager of the refinery.

Jakob (Jack) Grynberg has opened consulting offices in Denver to specialize in quantitative electric log interpretation and property evaluation. A graduate of Colorado School of Mines, Grynberg was formerly engaged in well logging research for Continental Oil Co.

R. W. McDowell, Tulsa, president of D-X Sunray Oil Co., has been elected a director of Great Lakes Pipe Line Co. McDowell succeeds **Jacob France,** former president and chairman of the board of Mid-Continent Petroleum Corp., who resigned after 24 years on the Great Lakes board.

Kenneth R. D. Wolfe, vice president of Fisher Governor Co., Marshalltown, Iowa, has been elected president of the National Council for L.P.-Gas Promotion. He succeeds James E. Pew, manager of the natural-gas and natural-gasoline department for Sun Oil Co., who died June 19.

H. G. Meador, W. L. Naylor, R. O. Rhodes, and **T. J. Sullivan** have been elected senior vice presidents of Gulf Oil Corp., New York. Meador is former vice president of domestic marketing; Naylor, former vice president and comptroller; Rhodes, former vice president of production; and Sullivan, former vice president of manufacturing. **B. H. Barnes** and **Dr. Jerry McAfee** have been elected vice presidents in charge of manufacturing for the corporation. **R. L. Boggs** has been named vice president, production; and **Dr. B. B. Wescott,** vice president, research. New comptroller is **F. B. Branson.** The president, executive vice president, and senior vice presidents will comprise the new management committee which will assist in formulating objectives, policies, plans and programs, and coordination of the company's world-wide activities.

James R. Arrington has been named manager of the economics department of Carter Oil Co., Tulsa, succeeding **G. D. Priestman.** Priestman, head of the department for the last 4 years, will soon leave Carter to become head of the economics section of the producing coordination department of Standard Oil Co. (N. J.), in New York. Arrington joined Carter in 1937. In 1951 he became chief economist and was named assistant manager of the economics department in 1953.

James W. Foley, vice president and director of The Texas Co., has been elected executive vice president. Foley joined Texaco in 1932. Following service abroad with Bahrain Petroleum Co., Ltd., in which Texaco has a 50 per cent interest, he held various positions in The Texas Co.'s domestic producing department, later serving as assistant to the manager and as assistant to the vice president in charge of domestic producing. In 1950 he was appointed assistant to the chairman of the board. He became vice president in 1953 and a director the following year.

R. P. Hopson has resigned as vice president and assistant general manager of Texaco-Cities Service Pipe Line Co. and has retired after 36 years' association with the Texaco organization. Hopson was also vice president and general manager of Kaw Pipe Line Co. **S. G. Kershner,** vice president and general manager of Texas Pipe Line Co., has been elected vice president of Texaco-Cities Service and of Kaw. **A. N. Horne** has been elected vice president and general manager of Kaw.

Tom E. Turner has resigned as district geologist for Stanolind Oil & Gas Co. in Salt Lake City to begin an independent consulting practice there.

Thomas Weir, vice president and general manager of Union Gas Co., Ltd., Chatham, Ont., has been elected

PERSONALS

president of the Natural Gas and Petroleum Association of Canada. Weir is a past president of the Canadian Gas Association and is serving his second term as a director of the American Gas Association.

William R. Connole, West Hartford, Conn., has taken office as a member of the Federal Power Commission, replacing **Nelson Lee Smith,** who has resigned. Connole had been chief legal officer of the Connecticut Public Utilities Commission since 1950. His FPC term will run to June 22, 1960.

George H. Sherill, geologist formerly associated with Seaboard Oil Co. of Delaware in Abilene, Tex., has joined the firm of L. E. Scherck, independent oil operator in San Angelo, Tex.

Dr. John C. Calhoun, Jr., nationally prominent petroleum and natural-gas engineer and head of the department of petroleum and natural-gas engineering at Pennsylvania State University, has been named dean of engineering at Texas A. & M. College, College Station, Tex. Widely acknowledged as a professional consultant, particularly in the field of secondary recovery, Dr. Calhoun is the Pennsylvania member of the Interstate Oil Compact Commission and a member of the engineering committee for the commission. In 1947, Dr. Calhoun began writing the regular weekly feature, "Engineering Fundamentals," for The Oil and Gas Journal. The columns were revised and published in book form under the title, "Fundamentals of Reservoir Engineering."

J. K. Moore, supervisor of crude oil in Shell Oil Co.'s transportation and supplies department in Houston, has been appointed area crude-oil representative in Denver. Joining Shell's crude-oil department in 1941, Moore has served as crude-oil scout and chief scout and has held his present position since 1952.

Hugh Shannon, former production manager of Carter Oil Co.'s southern division in Shreveport, has been named vice president and general manager of Trident Drilling Co., Ltd., subsidiary of Bailey-Selburn Oil & Gas, Ltd., with headquarters in Calgary.

M. S. METZ

M. S. Metz, area exploration manager for Shell Oil Co. at Midland, Tex., has been named manager of Shell's Houston area exploration department. He replaces **Sherwood Buckstaff,** who has been assigned to the company's head office exploration staff in New York. Metz has been with Shell 18 years and has held the Midland managerial post since 1951.

T. S. Petersen, president of Standard Oil Co. of California, has been asked by President Eisenhower to serve as businessmen's representative on his committee for traffic safety.

Harold H. Healy, Casper, Wyo., has taken office as president of the Rocky Mountain Oil and Gas Association. Healy, an attorney and independent oil operator, formerly was division manager of Ohio Oil Co. at Casper.

Hugo R. Kamb, formerly division geologist in Houston for Crown Central Petroleum Corp., has joined Delhi-Taylor Oil Corp. in Dallas as senior staff geologist. **Norman C. Miller** has resigned as district geologist in Oklahoma City for Ashland Oil & Refining Co. to join Delhi-Taylor as district geologist in that firm's new Oklahoma City district geological office.

DEATHS

LeValley Irving Brockway, 44, chief geophysicist for Western Gulf Oil Co., died recently at his home in Bakersfield, Calif.

Vaughn Walter Russom, 63, geologist with Sinclair Oil & Gas Co., died of heart failure June 27 at McAlester, Okla. Russom had been with Sinclair since 1926 and was recognized primarily for his extensive surface geological work in the Mid-Continent and Rocky Mountain areas.

Sam W. Mitchell, 83, Montana secretary of state and member of the State Land Board which supervises oil and gas leasing, died recently at his home in Helena.

King Gaines Gillette, 64, former president of Golden West Petroleum Co. and son of the late razor manufacturer, died recently at his home in Newport Beach, Calif.

Dee A. Sikes, 54, vice president of Helmerich & Payne, Inc., died June 24 at his home in Tulsa. Sikes became associated with Helmerich & Payne in 1949 and was promoted to vice president in 1953. He was in charge of the firm's drilling contracts and public relations.

Amon Giles Carter, 75, publisher of the Fort Worth Star-Telegram and independent oil operator, died June 23 in Fort Worth. He was also chairman of Carter Publications, Inc. Carter's first successful oil venture took place in 1935 when he brought in a wildcat in Lea County, New Mexico. He realized major success from his discovery of the vast Wasson field in Gaines and Yoakum counties in far West Texas. He sold his holdings in the Gaines County portion of the field in 1947 for $16,500,000.

Edward W. Johnson, 44, manager of process-pump sales for the Oil Well Supply Division of U. S. Steel Corp., died recently in Dallas.

Delmar Richard Guinn, 53, development geologist for Cities Service Oil Co., died June 23 in Bartlesville, Okla. Guinn had served the company in New Mexico and Texas before moving to Bartlesville in 1947.

John M. Brokaw, Jr., 57, Pure Oil Co. geologist, died recently of a heart attack at Billings, Mont. He was employed by Pure Oil for 21 years and had been transferred to Billings from Houston in 1952.

D. E. (Gene) Kervin, 64, retired partner in the M. J. Delaney Co., drilling contractors, died recently in a Dallas hospital. Kervin was with the Delaney firm when it was located in Tulsa and later in Dallas. He retired from active drilling work 3 or 4 years ago.

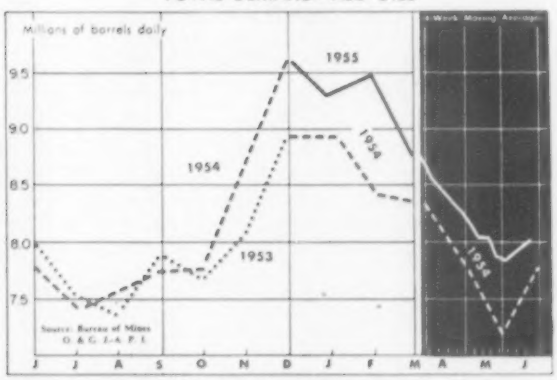
H. Carl Wolf, 63, retired managing director of the American Gas Association, died June 26 in White Plains, N. Y. Wolf became managing director of the gas industry's trade organization in 1945 after serving as a director and chairman of its national advertising committee. He had been a consultant since his retirement.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,624,425	UP	3,050	UP	111,630
Crude stocks	275,768,000	DOWN	924,000	DOWN	1,905,000
Completions	1,226	UP	57	UP	240
Refinery runs	7,464,000	DOWN	56,000	UP	525,000
Gasoline stocks	164,471,000	DOWN	814,000	DOWN	3,676,000
Distillate stocks	96,338,000	UP	5,069,000	UP	13,325,000
Residual stocks	45,584,000	DOWN	100,000	DOWN	4,778,000
Four-product stocks	335,525,000	UP	4,852,000	UP	7,066,000
Total imports	1,040,600	DOWN	160,900	UP	107,100

TOTAL DEMAND—ALL OILS



Refiners Make Less Residual Fuel, Imports Gain, Stocks Drop

GAINS in residual-fuel demand so far this year have been met by increased imports and stock reductions. Refiners in this country have produced less heavy fuel than they did last year.

Total demand for residual in 1955 has averaged about 1,674,000 bbl. daily for a gain of about 7.4 per cent over last year. This increase does not follow the demand trend of recent years. Total demand for resid in 1954 was about 60,000 bbl. daily less than in 1950 with no big variation for the intervening years.

Production of heavy fuel at refineries in this country has averaged about 13,000 bbl. daily less than last year despite an increase in refinery runs of about 415,000 bbl. daily. Refiners are making about 6.5 per cent less resid from each barrel of crude this year. Part of the reduction has been due to increased coking and part to a gain in production of asphalt and road oils.

In contrast with the cut in refinery output of resid, imports of this fuel have averaged about 91,000 bbl. daily more than last year. First-quarter imports were up 122,000 bbl. daily over the first quarter of 1954.

However, this large gain in imports of heavy fuel has not been enough to cover the combination of increased demand and reduced production. Residual stocks dropped from 52,105,000 bbl. at the first of the year to 45,684,000 bbl. on June 17 for a net withdrawal of 6,421,000 bbl. All of the decrease was on the West Coast where inventories were reduced from 29,429,000 bbl. to 21,841,000 bbl. or a net drop of 7,588,000 bbl. Residual stocks gained 1,167,000 bbl. in areas east of California.

Shipments to the East Coast accounted for part of the reduction in California. The movement amounted to slightly more than 2,000,000 bbl. for the first 4 months of the year, and current reports indicate that shipments are continuing. One company is reported to have made a deal for about 5,000,000 bbl. Total West Coast-East Coast movement of residual last year was less than 2,000,000 bbl. with none reported for either 1952 or 1953.

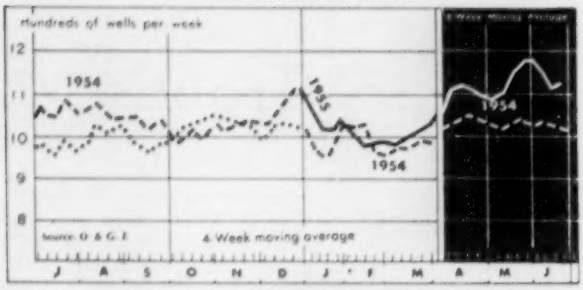
Residual stocks for the combined Gulf-East Coast areas are at about the same level as last year, but District 2 stocks are down about 600,000 bbl.

Current data on residual inventories by districts are compared with stocks for other dates over the past year in the accompanying table.

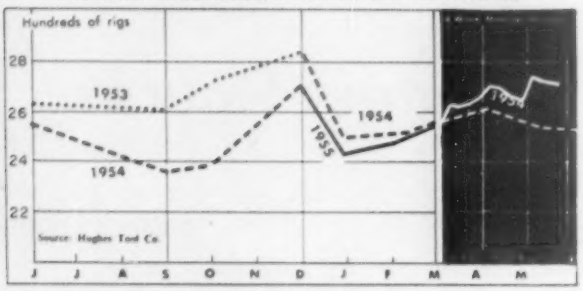
RESIDUAL FUEL STOCKS
(Thousands of barrels)

	June 17, 1955	Mar. 31, 1955	Dec. 31, 1954	June 30, 1954
East Coast	9,766	8,148	9,360	9,741
Appalachian 1	310	291	445	495
Appalachian 2	268	118	213	262
Ill., Ind., Ky.	4,394	3,127	3,660	4,417
Okla., Kans., Mo.	888	857	1,260	1,462
Inland Texas	1,322	1,314	1,368	1,280
Texas Gulf Coast	4,707	4,060	4,086	4,670
La. Gulf Coast	1,269	1,450	1,328	1,390
N. La. and Ark.	56	107	121	143
New Mexico	28	31	34	22
Other Rocky Mtn.	835	629	801	903
California	21,841	24,838	29,429	25,431
Total U. S.	45,684	44,970	52,105	50,216
East of California	23,843	20,132	22,676	24,785

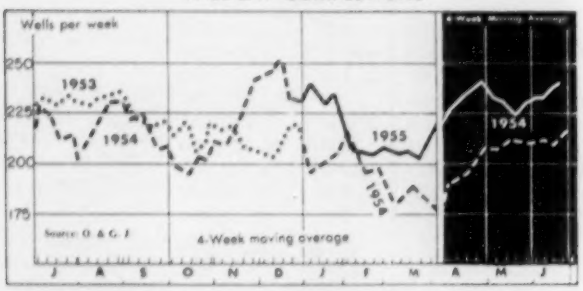
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	6-27-55	Change from 6-20-55	Change from 6-28-54
Gulf Coast	599	19	68
N. and W. Texas-New Mexico	861	—34	66
Arkansas-N. Louisiana-E. Texas	174	—14	2
Oklahoma	326	—15	15
Kansas-S. Nebraska	180	9	4
Illinois-Eastern	155	7	16
Rocky Mountain	265	14	25
Pacific Coast	153	3	17
Total United States	2,713	—11	213
Western Canada	195	11	80

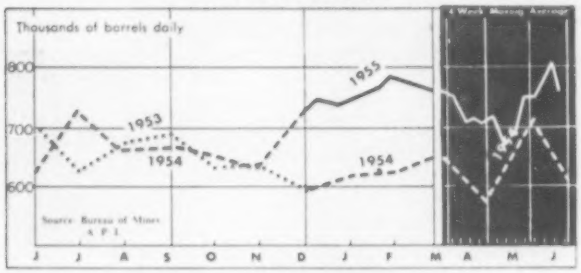
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JUNE 25, 1955

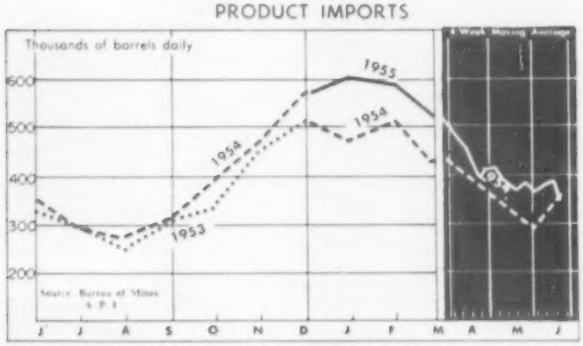
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	0	0	1	3,909	41	52	0	0	0	1	1	0	0	0	39	39
Arkansas	14	7	1	6	50,383	346	277	0	0	1	3	4	16	0	2	84	102
California	48	33	3	12	224,357	1,252	1,205	2	0	1	8	11	21	0	6	192	219
Colorado	32	16	2	14	167,897	669	624	2	0	2	11	15	24	0	17	329	370
Illinois	79	42	0	37	187,468	1,761	1,319	1	0	0	11	12	29	0	1	259	289
Indiana	19	9	0	10	24,276	368	394	0	0	0	3	3	8	0	0	159	167
Kansas	100	45	8	47	341,269	2,453	2,099	4	0	0	15	19	68	1	18	387	474
Kentucky	33	11	5	17	56,127	610	539	1	0	0	8	9	22	0	5	98	125
Louisiana	86	57	4	25	580,065	1,925	1,562	1	2	0	11	14	58	42	13	193	306
North	43	31	2	10	147,263	1,036	836	1	0	0	4	5	11	3	1	77	92
South	43	26	2	15	432,802	889	726	0	2	0	7	9	47	39	12	116	214
Michigan	7	4	0	3	17,333	249	267	0	0	0	2	2	6	0	0	95	101
Mississippi	12	6	0	6	83,905	234	182	3	0	0	3	6	9	0	0	85	94
Montana	5	4	0	1	19,934	151	132	1	0	0	1	2	4	0	1	42	47
Nebraska	18	5	0	13	102,678	341	171	1	0	0	10	11	18	0	0	137	155
New Mexico	43	22	16	5	147,277	732	501	0	0	0	2	2	17	1	6	55	79
Northwest	15	0	14	1	42,451	212	145	0	0	0	1	1	2	0	6	20	28
Southeast	28	22	2	4	104,826	520	356	0	0	0	1	1	15	1	0	35	51
North Dakota	5	4	0	1	45,934	108	121	1	0	0	1	2	1	0	0	19	20
Ohio	31	18	6	7	65,255	531	558	0	0	0	1	1	1	0	4	14	19
Oklahoma	171	114	5	*52	621,080	4,120	4,358	2	0	1	12	15	64	7	18	312	401
Pennsylvania-New York	30	12	4	†14	66,806	805	1,173	0	0	0	2	2	0	0	5	7	12
Texas	463	265	10	188	1,817,662	9,557	8,754	19	1	2	105	127	364	52	68	1,973	2,457
Southwest (1 & 4)	60	32	3	25	253,388	1,483	1,219	1	1	0	20	22	45	16	21	382	464
Gulf Coast (2 & 3)	37	21	1	15	257,131	1,232	1,271	3	0	1	11	15	42	28	24	307	401
East (5 & 6)	25	11	3	11	120,487	466	461	1	0	0	7	8	14	3	3	148	168
North Central (7-B & 9)	219	110	2	107	616,313	3,497	3,304	11	0	1	53	65	189	0	7	760	956
West (7-C & 8)	104	77	0	27	520,912	2,407	2,037	3	0	0	14	17	71	1	6	364	442
Panhandle (10)	18	14	1	3	49,431	472	462	0	0	0	0	0	3	4	7	12	26
Utah	6	1	0	5	27,171	37	32	0	0	0	4	4	3	0	2	22	27
West Virginia	9	1	7	1	21,976	290	258	0	0	1	0	1	0	0	8	10	18
Wyoming	13	6	0	7	72,802	368	658	0	0	0	4	4	11	0	3	76	90
Miscellaneous (S. D.)	1	0	0	1	3,640	17	80	0	0	0	1	1	0	0	0	13	13
Total United States	**1,226**	682	71	473	4,749,204	26,965	25,316	38	3	8	219	**268**	744	103	177	4,600	5,624
Total previous week	1,169	651	69	449	4,588,226			32	2	12	198	244	706	100	169	4,381	5,356
Total June 26, 1954	986	530	111	345	4,185,251			35	4	16	160	215	691	76	179	4,205	5,151
Western Canada	57	38	2	17	203,040												

Service wells included: *4, †6.

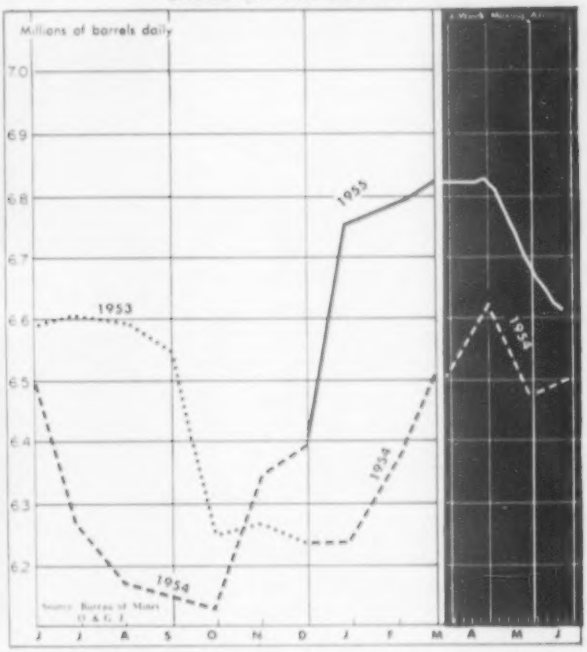
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE OIL PRODUCTION

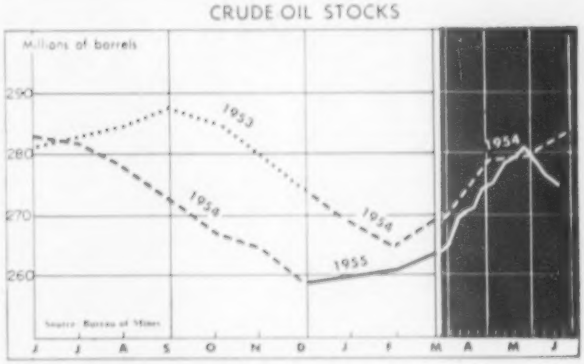


DAILY AVERAGE PRODUCTION FOR WEEK

	June 25			June 18
	Crude oil	Lease condensate	Total	total
Alabama	3,600		3,600	3,700
Arkansas	76,750	500	77,250	74,000
California	973,200		973,200	977,400
Colorado	140,100		140,100	140,900
Eastern	46,500		46,500	46,500
Florida	1,300		1,300	1,300
Illinois	233,800		233,800	228,100
Indiana	29,900		29,900	29,500
Kansas	321,000		321,000	318,000
Kentucky	40,200		40,200	40,200
Louisiana	641,900	47,800	689,700	688,400
North	113,900	2,800	116,700	115,400
South	528,000	45,000	573,000	573,000
Michigan	31,300		31,300	30,800
Mississippi	94,150	4,150	98,300	98,300
Montana	45,600		45,600	44,900
Nebraska	29,600		29,600	29,700
New Mexico	221,900	3,550	225,450	225,550
North Dakota	20,900		20,900	20,600
Oklahoma	547,100		547,100	554,400
Texas	2,733,200	47,325	2,780,525	2,780,525
Dist. 1	53,000	550	53,550	53,550
Dist. 2	136,700	7,500	144,200	144,200
Dist. 3	421,000	21,500	442,500	442,500
Dist. 4	230,800	5,200	236,000	236,000
Dist. 5	45,500	400	45,900	45,900
Dist. 6	115,800	4,800	120,600	120,600
East Texas field	207,300		207,300	207,300
Dist. 7-B	141,000	50	141,050	141,050
Dist. 7-C	183,000	4,600	187,600	187,600
Dist. 8	906,000	2,100	908,100	908,100
Dist. 9	204,600	500	205,100	205,100
Dist. 10	88,500	125	88,625	88,625
Utah	5,600		5,600	5,700
Wyoming	283,200		283,200	282,700
Others	‡300		‡300	200
Total U. S.	6,521,100	103,325	**6,624,425**	6,621,375
Change from previous week, up			**3,050**	
Canada	†375,550		†375,550	†370,175
Total U. S. production January 1-June 25			1,184,208,675 bbl.	
Same period last year (crude plus cond.)			*1,135,632,320 bbl.	

*Includes 18,075,675 bbl. condensate. †Week ended previous Monday. ‡S. D. 100, Nev. 200.

CRUDE OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

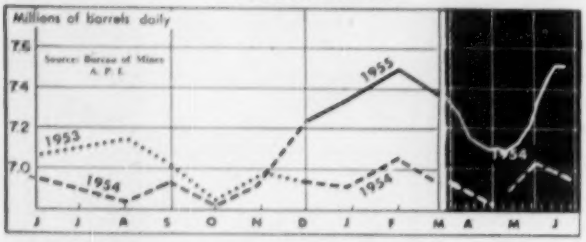
(Thousands of barrels)

	June 18, '55	June 11, '55	June 19, '54
Pennsylvania Grade	2,809	2,840	3,283
Other Appalachian	1,937	1,960	1,842
Illinois, Indiana, Michigan	11,939	11,954	12,666
Nebraska, North Dakota	2,025	2,185	(‡)
Kansas	8,547	8,505	9,685
Oklahoma	24,035	24,354	27,218
Arkansas	2,913	2,849	3,395
Louisiana	15,458	16,075	16,113
North	2,650	2,692	2,384
South	12,808	13,383	13,729
Mississippi	3,010	2,928	3,123
New Mexico	8,464	8,379	7,170
Texas	129,504	129,702	130,366
East Texas proper	10,284	10,242	12,056
West Texas	57,313	58,025	55,559
Texas Gulf	26,477	26,303	29,383
Other Texas	35,430	35,132	33,368
Wyoming	16,042	15,546	13,110
Other Rocky Mountain	5,142	5,216	4,740
California	31,571	31,352	32,459
Foreign	†12,372	12,847	12,503
Total	275,768	276,692	277,673

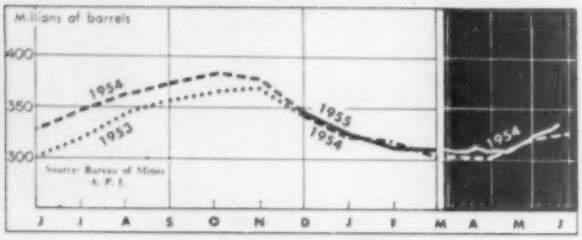
*Bureau of Mines. †Includes 2,582,000 bbl. in California. ‡Included with Kansas.

CURRENT DATA ON RUNS AND PRODUCTION ARE 4-WEEK AVERAGES

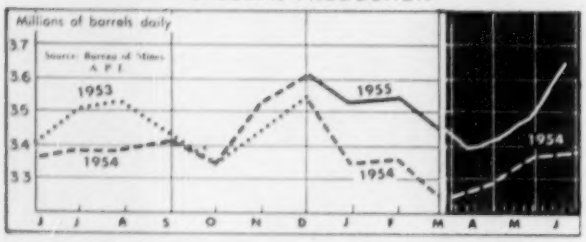
REFINERY RUNS



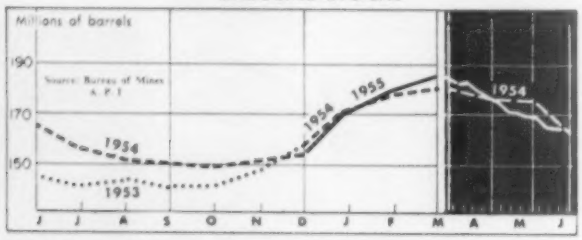
FOUR-PRODUCT STOCKS



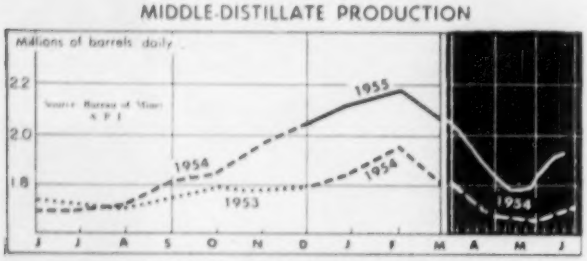
GASOLINE PRODUCTION



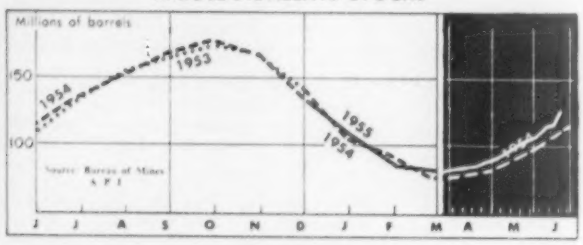
GASOLINE STOCKS



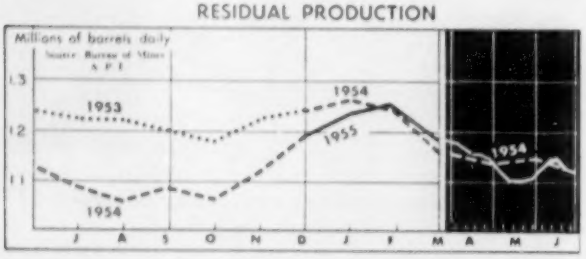
MIDDLE-DISTILLATE PRODUCTION



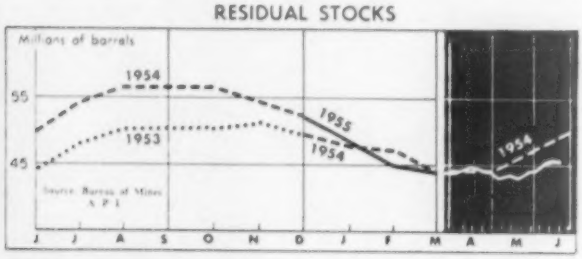
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



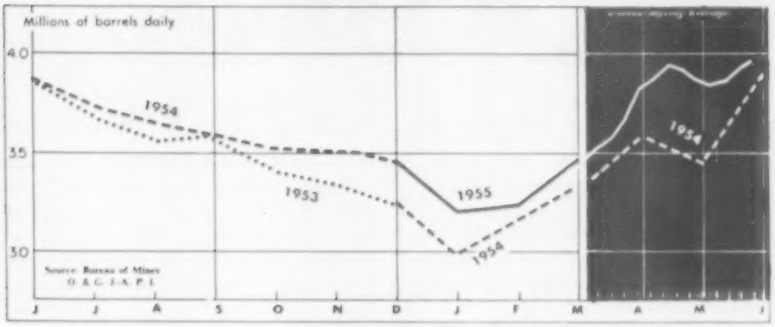
A.P.I. REFINERY REPORT, JUNE 24

(Thousands of barrels)

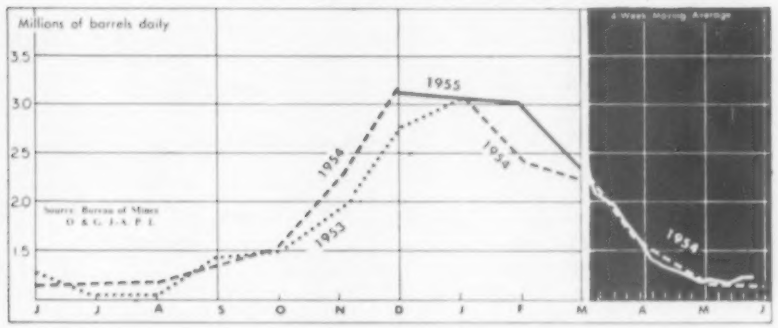
District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, June 1954 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,010	420.1	31.9	248.1	176.9	35,621	11,626	30,921	9,894	1,031	429.3	31.4	230.1	187.5
Appalachian:														
District 1	97	38.3	2.6	21.1	7.6	4,375	496	1,918	334	107	47.2	3.5	23.9	8.5
District 2	85	48.7	6.1	10.9	11.9	2,363	476	735	299	93	52.8	3.5	10.2	10.7
Ind., Ill., Ky.	1,420	779.9	66.3	267.1	170.1	34,600	6,751	18,185	4,413	1,273	675.1	67.4	234.2	154.4
Okla., Kans., Mo.	699	421.6	16.0	162.3	38.7	15,628	1,729	10,682	928	615	350.6	19.7	132.4	43.8
Inland Texas	241	181.9	8.3	47.9	21.3	6,341	398	1,796	1,295	243	173.4	8.6	44.2	23.7
Texas Gulf Coast	1,785	842.0	79.1	456.4	218.7	23,463	3,777	12,206	5,099	1,630	779.9	103.5	357.5	220.2
La. Gulf Coast	707	334.0	36.1	181.9	73.3	10,212	2,264	5,750	1,496	565	268.1	51.3	143.0	46.4
N. La. and Ark.	86	34.1	11.6	18.7	6.0	3,559	978	1,851	58	89	36.0	7.4	19.7	6.5
Rocky Mountain:														
New Mexico	21	11.9	0.9	3.0	2.7	241	4	103	28	20	11.7	0.2	3.7	2.6
Other Rocky Mtn.	261	120.6	5.0	61.3	36.4	6,981	269	2,254	861	256	126.6	3.8	56.1	36.6
California	1,052	460.7	14.1	167.3	324.3	21,087	364	9,937	20,879	1,024	428.6	5.6	143.9	382.1
June 24, 1955	7,464	3,692.9	278.0	1,646.0	1,087.9	164,471	29,132	96,338	45,584	6,947	3,379.3	305.9	1,398.9	1,123.0
June 17, 1955	7,520	3,647.9	313.9	1,600.7	1,158.4	165,285	28,435	91,269	45,684					
June 25, 1954	6,939	3,408.9	299.3	1,385.7	1,124.9	168,147	26,937	83,013	50,362					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

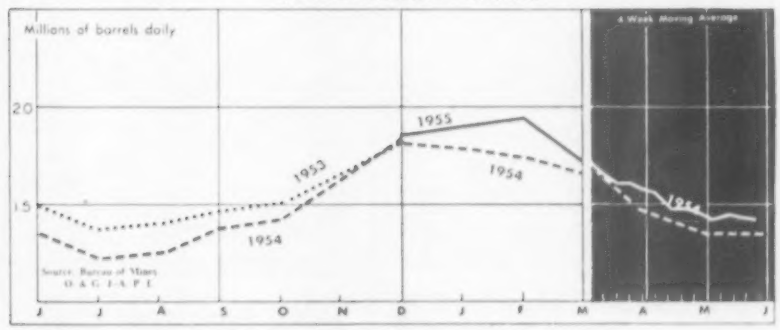
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of June 29, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.75-11.25	11.25-12	10.25-10.75
Premium gasoline	12-12.5	13-13.75	11.50-12
42-44 w.w. kerosine	9.25-9.625	10.05	8.5-8.75
No. 2 straw fuel oil	8.375-8.75	9.3	8.0-8.25
No. 6 residual	$1.75-1.80	$2.35-2.45	$2.00-2.05

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.0	4.5	4.75
Grade 18-55	6.0	5.5	5.75

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Natural-gasoline prices moved up 0.5 cent a gallon for Grade 26-70. Sales were reported at the higher price in North Texas on June 28, followed by an increase on the Group 3 market June 29. The tone of the motor fuel market has improved slightly on the Gulf Coast, but service station price wars continue on the East Coast.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 6-24-55	3,655	3,941
April 1955	3,502	3,786
May 1954	3,377	3,463
June 1954	3,379	3,894
Middle distillate:		
Four weeks ended 6-24-55	1,936	1,231
April 1955	1,847	1,489
May 1954	1,673	1,167
June 1954	1,705	1,151
Residual fuel:		
Four weeks ended 6-24-55	1,128	1,408
April 1955	1,110	1,553
May 1954	1,148	1,342
June 1954	1,123	1,339

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87			
15-15.9	1.93			
16-16.9	1.99			
17-17.9	2.05			
18-18.9	2.11			
19-19.9	2.18			
20-20.9	2.24	$2.50		$2.37
21-21.9	2.30	2.52		2.39
22-22.9	2.37	2.54		2.41
23-23.9	2.45	2.56		2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Sour. Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, January 21, 1955.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.50
Middle District	3.37
Southwest Pennsylvania	3.08
West Virginia	2.97
Buckeye Grade	2.91
Zanesville Grade	2.72
Illinois Basin	2.90

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FOR SALE—Equipment: 24L Rig Bucyrus Erie, butane operated, completely equipped; tools, pipe, trucks, tanks, etc. Ready to go to work; excellent condition. Box H-888, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE, at Oil Hill, Kansas, 7 miles 3" lap weld, standard weight, plain end line pipe being reclaimed and formerly used as a high pressure air line. Clean inside. Extra good quality. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply, Tulsa.

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Like new skid mounted portable high pressure unit consisting of 1—Clark Gas Engine-Compressor, 1—Clarkooler and 1—starting air compressor.

Gas Engine—4 cyl., 2 cycle, 150 HP @ 600 RPM.

Compressor—2 stage, 38.5 MSCF/hr. @ 2300 psig discharge pressure.

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Purchasing Department
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4½" O.D.—.188 wall—approx. 9½ lbs. D.R. Lengths—approx. 10,000 ft.
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10¾" O.D.—.203 wall—22.88 lb. double random lengths—approx. 20,000 ft.
26" O.D.—.188 wall 40' lengths—approx. 1000 ft.
26" O.D.—.188 wall 40' lengths—approx. 1000 ft.
30" O.D.—.344 wall—40' lengths—approx. 600 ft.

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8⅝" O.D.—.322 wall—28.55 lb.—16' to 20' Random Lengths—approx. 8500 ft.
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IMMEDIATE DELIVERY
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POWER DRILLING RIG complete with Wilson Super Draw Works and 6 x 12 Wilson Snyder Pump, each operated separately by 145 Horse Power GKU Waukesha Motors. All other equipment in first class condition. Rig is equipped with 80 ft. A Frame or Mast and 3500', 3½" OD, Range 2, Drill Pipe with API full hole tool joints. Rig will go 3300' easily. Call, wire or write: Louisiana Iron & Supply Company, Shreveport, Louisiana.

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All materials guaranteed factory new, manufactured 1952. No leasing agreement required. Write for detailed list and prices.

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#527—Franks Model 44-TM, Single Drum, Truck Mounted Servicing Unit, 8x10x50' Single Pole Mast, Mounted on FWD Truck.
#536—Franks Model E.T. Single Drum Servicing Unit, 8x10x62' Single Pole Mast, Mounted on 1941 88 F International Truck.
#526—Franks Super East Texas Double Clutch, Single Drum, Mounted upon KS-11 International Truck. No Mast.
#541—Franks Model ET Single Drum with 8x10x62 ft. Mast, Mounted upon 1948 Model K8 International Truck.

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#525—50/60 Ideco Skid Servicing Unit. Double Pole Mast. Mounted on International Tandem Truck.
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Write, Wire or Call

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FOR SALE—Horizontal Duplex Steam Pumps—10x8½x12—353 GPM—bronze fitted—max. discharge pressure 100 lbs.—6" suction—5" discharge—mfg. by American Marsh Co. Quantity available—NEW—Boston Metals Co. 313 E. Baltimore St., Baltimore 2, Md., Curtis 7-5050.

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3—800# 20 MMCF Absorbers with Scrubers, ets.
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1—30"x62' Depropanizer with Accumulator, Reboiler and Condenser.
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100,000' of 8⅝" O.D. 23.57# 264 wall, PE BFW Seamless Line Pipe, 32' lengths, strictly #1 grade.

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75,000' of 6⅝" O.D. 18.97# 280 wall, PE BFW Lapweld Line Pipe, 42' lengths, #2 grade.

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18,000' of 8⅝" O.D. 15.86# .1644 wall, Man-ten steel, mill coated outside only, 40' lengths Spiral Weld Line Pipe PE. (NEW).

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TULSA, OKLAHOMA

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GARDNER-DENVER FXD 7¼"x10" Mud Pump unitized with engine. Skid mounted. General Tool & Supply Co., Box 4387, Oklahoma City, Okla.

FOR SALE: A Clean 1500' FAILING Model 44 Rotary Drill and Core Rig mounted on 4 wheel drive truck, complete with Dog House, Light Plant, and tools ready to work. Located in Eastern Illinois. Contact R. A. Landrey, Washington, Indiana. Phone 2395 W.

4—Cooper-Bessemer Gas Engine Generating Units,

With exciter, generating panel, accessories.

1—300 KW, 450 hp. (reconnectable to 480-volt) 400-r.p.m. Type JSG-8.

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Phone RIverside 7-1394

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FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa. Phone GIbson 7-9700.

FOR SALE: 1—National 2½' x 13' 125# WP Low Pressure Vertical Separator and 1—Petco 1000# WP Porous Plastic Horizontal Separator, each complete with controls. Location Joaquin, Texas. Box H-866, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—At Oil Hill, Kansas, 4—Cooper Type 80 Twin Engine Compressor Units, with 8½"x20" Class A and 15½"x20" Class C Compressor Cylinders. Also 1—Type 80 Single DO. with 6½" and 10½" x 20" Tandem Cylinders. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-50 KW Generating Units

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CARDWELL S DRAWWORKS with WAK engine and air controls. 1948 model. Recently inspected and overhauled. All in excellent condition. Claypool Drilling Company, St. Elmo, Illinois.

FOR SALE: 1—Worthington Type HB Packaged Compressor Unit, single stage, 7" x 13" H-844 motor. Belt driven, equipped with 250# WP intake scrubber, Wahlberg-McCreary gas starting equipment and automatic controls. Delivery 1,600 MCFD at 100# intake, 350# discharge. Plant used 1 year. Box H-865, The Oil and Gas Journal, Tulsa, Oklahoma.

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Very good No. 1 grade, used pipe. Straight 20' single random lengths machine cleaned.
Choice of plain end or T&C. Ideal for oil, water and gas systems, 850 to 900 psi.
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EXCELLENT USED GA-500 EMSCO RIG

LOW ENGINE HOURS ● REBUILT CANTILEVER MAST ●

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5—600 HP IR Type KVG Gas Engine Driven 2 Stage Compressors (1942).

1—660 HP IR Type KVG Gas Engine Driven 2 Stage Compressor (1952).

550,000 New Spare Parts for Above.

2—IR Starting Air Compressors, Model 25c, Type 40, 265#, 67.6 cfm.

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1—6' x 38' x ½" Shell Chrome-lined, 21 Trays, New 1951.
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2—1250 Barrel Steel Welded Tanks.
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7—Admiralty Tube, 500 - 1800 sq. ft.
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8—715 sq. ft., 850 psig, 550° F., S.S.
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13—715 sq. ft. 125 psig, 300° F. S.S.
6—715 sq. ft. Admiralty 125 psig, 300° F.

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10,000' of 8", 6", 4" and 2" steel pipe.
500 Ton of structural steel, steel plate, angles and channels.
500 steel gate and globe valves.

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- **AUXILIARY EQUIPMENT:** Heat Exchangers—Pumps—Engines—Compressors—Metering & Control Equipment—Piping Boiler Plant—Steel Buildings—(47) Welded Storage Tanks from 300 to 35,000 bbl. capacity.

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CORE DRILLS, SPUDDERS, ROTARIES: New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

1250 FEET 9" O.D. New Duroline Cement Lined Pipe, Random Lengths PE, Pittsburgh area—Attractively Priced. D. A. MORITZ CO., Braddock, Pa., BRandywine 1-3700.

FOR SALE: 1—Beaird—Ingersoll-Rand packaged Compressor Plant, Type 6-JVG (165 H.P.) Heavy Duty, direct connected, 4-cycle, gas engine driven, single stage equipped with 2—4¼ x 9 compressor cylinders, three hand operated fixed volume pockets, two hand operated valve lifters, 20" O.D. 500# W.P. intake scrubber, air starting equipment and controls for automatic operation. Designed for intake pressure range 100#-250#, discharge pressure range 500#-600#. Delivery 3,480 MCF per day at 250# intake, 550# discharge. This plant has been in use less than 30 days and is located near Palestine, Texas. Box H-616, The Oil and Gas Journal, Tulsa, Oklahoma.

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2D-4D-5D PUMPING UNITS
#303—#404 Core Barrels

BUY DIRECT FROM FACTORY AT WHOLESALE PRICES

#4D and #5D Units A.P.I. Approved

Write for literature & prices.

East Side Machine Works

CHANUTE, KANSAS

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WANTED: MAGNETOMETERS, (Vertical Type Schmidt) preferred. Give all details condition of instrument, compensated or not compensated. Box H-890, The Oil and Gas Journal, Tulsa, Oklahoma.

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JUNIOR ENGINEER to operate experimental profiling device for water flood injection wells. Unequaled opportunity to learn newest secondary recovery techniques and to participate in experimental work. Location Nowata, Oklahoma. Approximately one-half time traveling. Prefer graduate engineer with working knowledge of electrical circuits and some oil field experience. Write Sinclair Research Laboratories, Inc., P. O. Box 3006, Whittier Station, Tulsa, Oklahoma.

Chemical Engineer

Process Engineer Advanced Degree. For Group Leader Process Engineering Dept. Eight to ten years experience in the chemical or petroleum fields. Must be versed in the design and application of chemical processing equipment.
Process Engineer Advanced Degree for Process Engineering Dept. Up to 5 years experience in the chemical or petroleum fields.
Chemical Engineer To prepare exploratory process and economic studies. To accumulate and interpret chemical economic and statistical data.

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Registered professional mechanical engineer with 10 to 15 years experience to supervise piping and mechanical design work for refineries, petrochemical, chloralkali and process industries.
We are a growing company specializing in industrial engineering. Pleasant working facilities, Houston location. Liberal insurance and hospital benefits. If you are interested and qualify, please mail resume and photograph to:

WYATT C. HEDRICK ENGINEERING CORPORATION.
P. O. Box 1133, Houston 1, Texas

HELP WANTED

OIL FIELD SUPPLY SALESMAN
City Sales in Tulsa. Supply store experience and knowledge of production equipment necessary. Contacts with major and independent operators required. Salary open. P. O. Box 2205, Tulsa, Okla.

GRADUATE Chemists with or without experience for positions in Research and Development department, located in Tulsa. State qualifications and salary expected. Write Personnel Department, P. O. Box 381, Tulsa, Oklahoma.

WANTED—Seismologist by independent oil firm. Permanent location in Dallas. Give full education, employment history, and minimum salary in initial letter of application. Reply Box H-835, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIGN ENGINEERS

Well established, progressive company expanding its Houston, Texas manufacturing facilities requires additional design engineers. Experience in design and development of oil well drilling tools and equipment would be favored. This is not just another job. If you have ability and can think, opportunity exists. Send complete information and salary requirements. Confidential.

BOX H-836,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

Mechanical Engineers

A medium sized leading manufacturer of oil field equipment and gray iron castings now needs additional engineers for product development and design work. Experience in similar or related work would be favored. All replies confidential. Write stating full qualifications and salary requirements to

BOX H-874,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

HELP WANTED

SUBSURFACE GEOLOGIST: Exploration Company has immediate opening for subsurface geologist with 3 to 5 years experience, preferably in Oklahoma. Location in Tulsa. Mail resume including personal history, employment record, educational background and salary requirements to Apache Oil Corporation, 823 South Detroit, Tulsa. All replies confidential.

A YOUNG ENGINEER with knowledge of geology for office and field work. You will receive well completion and production experience with independent oil company located in Tulsa, Okla. Please state age, experience, education, references, and salary expected. Strictly confidential. Box H-884, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREST MANAGEMENT

An independent, experienced land management organization. Our forest management division, rendering professional forestry services in La. and E. Texas, specializes in developing sustained timber yield on oil industry fee lands.

FARMCRAFT ASSOCIATES, INC.
Alexandria, Louisiana.

GEOLOGIST

Independent oil company has opening in Tulsa office for Geologist to handle operations in Oklahoma and Kansas. Must be experienced in this area and be qualified to handle intensive exploration program. Excellent salary and opportunity. Age limit 35. Give complete resume of past experience, education and personal information. Applications confidential.

BOX H-862,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

DRILLING ENGINEERS

MAGNOLIA PETROLEUM COMPANY has openings in the drilling section of the Petroleum Engineering Department for several experienced drilling engineers. This section specializes in engineering phases of drilling operations exclusively and is primarily concerned with our Company drilling equipment.

Applicants should desire to make a career in the drilling phase of the oil business.

Age range: 25-40.

Salaries commensurate with experience and level in organization.

Write with complete resumé of experience to:

D. V. CARTER,
Chief Petroleum Engineer,
MAGNOLIA PETROLEUM COMPANY
P. O. BOX 900
DALLAS 21, TEXAS

HELP WANTED

WATER-FLOOD ENGINEER—by independent oil-producing company. Should have field experience in Mid-Continent area water-flood development and operation. Reply should state qualifications and experience in detail. All applications confidential. Box H-873, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST for employment in Denver office of aggressive independent oil company. Three years' experience in West Texas geology required. Salary commensurate with experience and qualifications. Send detailed personal history and work experience. Box H-876, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED assistant refinery superintendent. Must be familiar with planning and scheduling of operations. Require heavy distillation experience. Familiar with laboratory and maintenance. State detailed supervisory experience, age, education and salary requirements. Write Box 426, Irving, Texas or phone Dallas RI-4645.

GRADUATE Petroleum & Civil Engineers. Large producing oil company with expanding offshore drilling and production operations needs Petroleum and Civil Engineers for work in their production department. Petroleum Engineers with four years or less experience will be placed in drilling or production engineering work. Civil Engineers with three years or less experience will be placed in the department's construction division. Please write stating age, experience, school, date graduated, etc. Personal interview will be arranged. All replies strictly confidential. Our fee paid. Contact Tom Robinson, owner, Oil Industry Employment Service, P. O. Box 2603, Tulsa, Okla. Phone GIbson 7-5974.

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In
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Unusual career openings in the fields of adsorption, ion exchange and catalysis. Test marketing and customer liaison involved. Men with potential in technical sales may qualify for responsible field positions.

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Men under 30 preferred with Bachelors or Masters degree.

Send resumé of educational background (please include approximate academic standing) and work experience to:

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A Division of
UNION CARBIDE AND CARBON CORPORATION
P. O. Box 44, Tonawanda, New York
Attention: Mr. Paul I. Emch

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Several graduate engineers with minimum 5 years' experience supervising maintenance engineering functions in oil refining or producing facilities, power plants, heavy industrial installations, manufacturing plants or related operations. To establish technical supervision, procedures, maintenance operations and schedule routine and special work for major oil producing and refining operation with all supporting facilities; i.e., housing, feeding, recreation, etc.

Salary commensurate with background and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 64

ARABIAN AMERICAN OIL COMPANY
505 PARK AVENUE
NEW YORK 22, NEW YORK

HELP WANTED

CHEMICAL ENGINEER, with or without experience, for employment in natural gasoline department progressive independent oil company. Must be willing to work in Texas, California or Canada. Prefer a man under 35. Box H-881, The Oil and Gas Journal, Tulsa, Oklahoma.

DISTRICT LANDMAN Position Open. Strong, independent company has position for District Landman at Midland, Texas. Applicant should supply complete resume of experience and qualifications which will be treated confidentially. Box H-868, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—To be on Management's Team—a Comptroller, preferably in his early thirties, who can accept responsibility for all financial accounting, bookkeeping and tax operations and policies of drilling contractor-producer, operating dozen rotary rigs and several hundred wells in four different areas. Excellent opportunity for right man. Salary $9,000 to $12,000, depending upon qualifications. Send all details and photo to Box H-883, The Oil and Gas Journal, Tulsa, Oklahoma.

EXCELLENT OPPORTUNITY with independent oil company for GRADUATE PETROLEUM ENGINEER, under 35, at Midland, Texas. Must have three years' West Texas experience and be outstanding in field production problems, workovers, testing, drill stems and completions. Replies confidential. P. O. Box 3053, Dallas, Texas.

NEED PRODUCTION MAN capable supervising 300 barrels production. Must be able handle completion work, all types and depths. Want non-drinker and Christian. Advise past record, age, salary expected, education, availability. Box H-783, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER

Excellent opportunity for young Chemical Engineer in natural gas division of a large progressive independent oil company. Prefer recent graduate or individual with no more than one or two years experience. To be located in Oklahoma. Please submit college transcript and recent photograph.

GEOLOGIST

Recent Geological or Geological Engineering graduates wanted for employment as seismo computer. Will be working with field seismic parties. Excellent opportunity for advancement. Please submit college transcript and recent photograph.

Box H-864, The Oil and Gas Journal, Tulsa, Oklahoma.

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COMMONWEALTH OIL REFINING CO., INC.

COMPLETING NEW REFINERY NEAR PONCE, PUERTO RICO

Immediate position for man with broad experience capable of directing operation of large modern integrated refinery including four catalytic processes.

Reply Air Mail giving complete resume including present salary, availability, etc.

COMMONWEALTH OIL REFINING CO., INC.
161 EAST 42ND STREET
NEW YORK 17, NEW YORK

SITUATIONS WANTED

DRILLING MACHINE and heavy equipment sales and service man available. Well versed in Cable tool and Rotary methods. Experienced in Rotary air drilling for blast hole work. Able to maintain good public relations. Can furnish excellent references. Box H-891, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

EXECUTIVE GEOLOGIST, 18 years experience, exploration and exploitation geology in Rocky Mountain Area. Desires association with small integrated company or independent. At present in management of major company. Box H-880, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST—Eight years seis. experience Southwest, desires employment with active company or independent. Box H-879, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING FOREMAN, 30, desires employment with aggressive independent operator or any growing concern serving the oil industry. Thorough experience in drilling operations and well completions. Write 202 Holly Dr., Midland, Texas, Phone 2-2879.

CHEM. ENGR.—41—15 yrs. wide experience all phases refining thru management level. Box H-871, The Oil and Gas Journal, Tulsa, Oklahoma.

PILOT—A.T.R. with single, multi-engine, and DC-3 ratings, graduate petroleum engineer. Experience in both lines. Interested in flying position, sales, or combination. Burt Hull, Jr., 2230 E. 31st., Tulsa.

SALES ENGINEER desires line for sale Louisiana, East Texas and Arkansas area. Especially familiar, Pumping, Heat Exchange, Compressing and Recycling. Headquarters, Shreveport. Box H-892, The Oil and Gas Journal, Tulsa, Oklahoma.

DIVISION PETROLEUM ENGINEER, B.S. degree, 11 years diversified experience, drilling, production, completions, workovers, reservoir, valuation work; 35 yrs. old, single, wants job with independent company or oil operator. Consider salary and or participation. Principal experience West Texas. Box H-889, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST, 35, geological engineering degree, 12 years exploration development experience Gulf Coast, N. Louisiana, E. Texas, U. S. and foreign. Available Aug. 1. Desires position with independent or group active in exploration. Excellent references, will relocate. Box H-887, The Oil and Gas Journal, Tulsa, Oklahoma.

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PETROLEUM ENGINEER, 38, two degrees, 9 years with Major in Gulf Coast, varied experience. Desire change. Box H-885, The Oil and Gas Journal, Tulsa, Oklahoma.

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Equipment Men

Cooper-Bessemer Corp. Licenses Italian Firm

A licensing agreement to build certain types of Cooper-Bessemer compressors in Italy has been made public by Gordon Lefebvre, president of the Cooper-Bessemer Corp., Mount Vernon, Ohio.

The agreement gives Termomeccanica Italiana of La Spezia, Italy, the license to manufacture current GMXA and GMVA, V-angle, engine-driven compressors. In addition, Termomeccanica may manufacture type EM, FM, and JM motor-driven compressors.

Both engine-driven and motor-driven compressors are manufactured for sale on the Italian mainland.

Powell Equipment Represents Cleaver-Brooks in Houston

The Cleaver-Brooks Co. has announced the appointment of Powell Equipment Co., Houston, as manufacturers' representative for the sale of Cleaver-Brooks boilers and equipment. Its territory will include 29 counties in Southeast Texas surrounding Houston.

Cleaver-Brooks Co. manufactures equipment for the generation and utilization of heat. Among its products are oil, gas, and combination oil-gas-fired stationary boilers, mobile steam boilers, distillation equipment, evaporators, and industrial oil and gas burners.

Du Pont Names Barada, Page To Sell CMC Mud Additive

E. I. du Pont de Nemours & Co. has announced the appointment of Barada & Page, Inc., as distributors of sodium carboxymethyl cellulose (CMC) for use in drilling muds.

Du Pont CMC was first introduced to the oil industry only a few months ago. It has gained acceptance as an economical stabilizing and filtration-reducing agent.

Barada & Page will service mud dealers from stocks carried at its branch warehouses in Houston, New Orleans, Corpus Christi, Dallas, Odessa, and Oklahoma City.

Jackson Joins Richards

Richards Machinery & Supply Co. of Shreveport has expanded its business to meet the requirements of the oil and gas industry.

S. D. Jackson, active in the Ark-La-Tex area for many years, has joined the Richards organization as sales manager.

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LEGAL

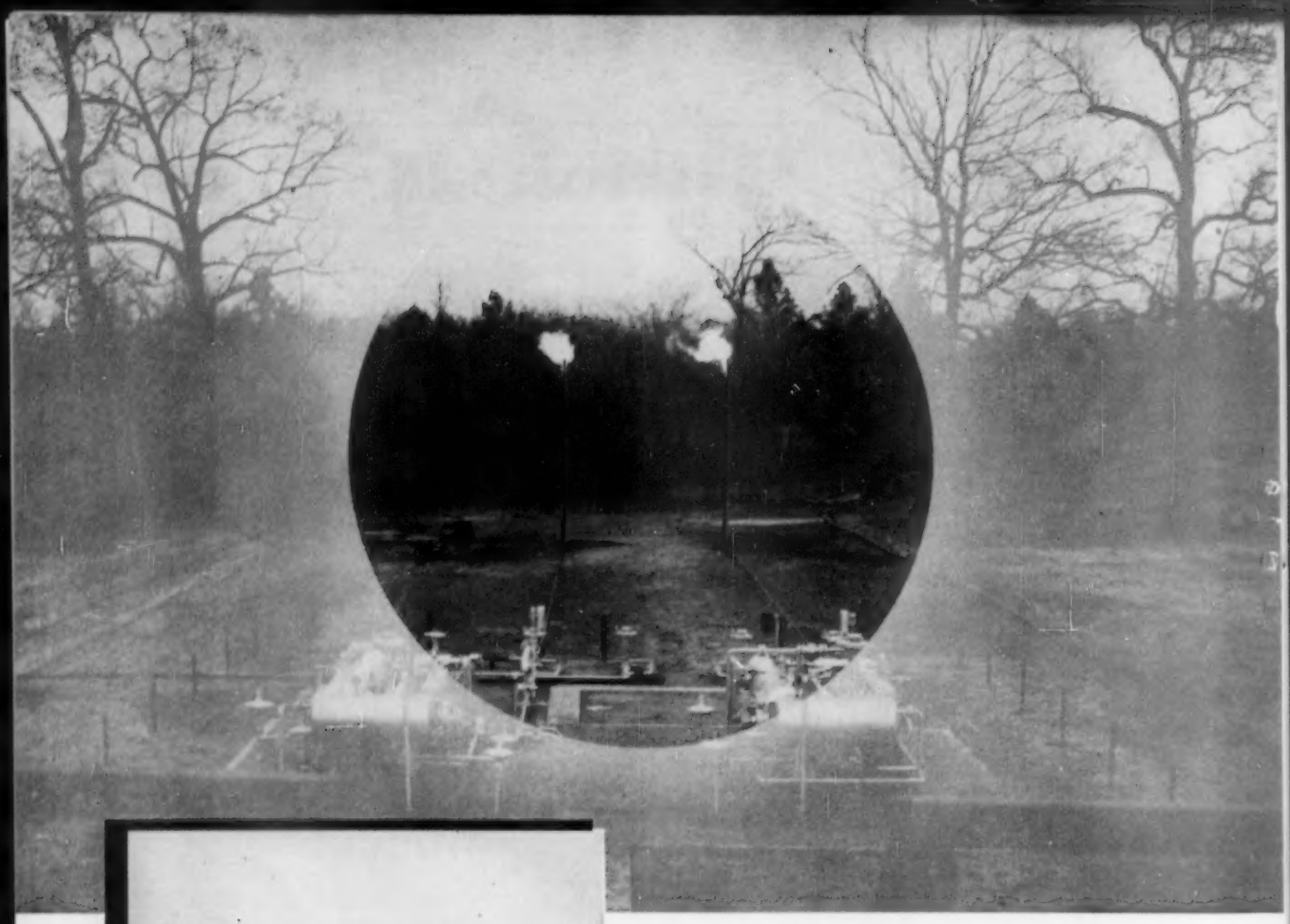
U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that two separate parcels of land, comprising 34.39 acres within the known geologic structure of the Waskom field, and 235.35 acres within the known geologic structure of the Mooringsport field, Louisiana, will be offered for oil and gas leasing through competitive bidding to the qualified bidders of the highest cash amounts per acre at 1:00 p.m., E.S.T., July 20, 1955, when bids will be opened. Details of the lease offering, description of the lands, how and where to submit bids, and bid forms may be obtained from the Supervisor, Eastern States Office, Bureau of Land Management, Washington 25, D. C. C. R. Drexilius, Supervisor.

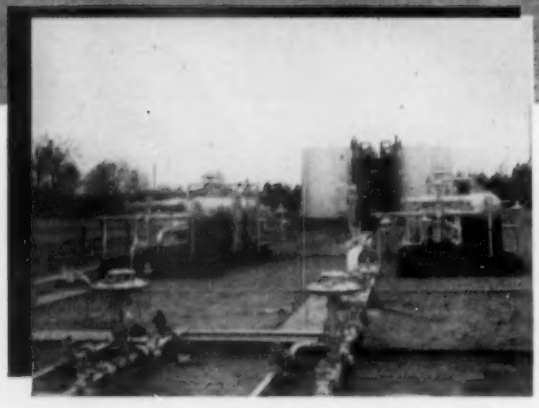
LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that two separate parcels of land, comprising 42.17 acres within the known geologic structure of the Cartersville field, and 48.52 acres within the known geologic structure of the Elm Grove field, Louisiana, will be offered for oil and gas leasing through competitive bidding to the qualified bidders of the highest cash amounts per acre at 1:00 p.m., E.S.T., July 27, 1955, when bids will be opened. Details of the lease offering, description of the lands, how and where to submit bids, and bid forms may be obtained from the Supervisor, Eastern States Office, Bureau of Land Management, Washington 25, D. C. C. R. Drexilius, Supervisor.

LEGAL

Sealed bids on leases for oil and gas mining purposes will be received until 10:00 A. M. Friday, July 22, 1955, and opened at that time at the Anadarko Area Office, Anadarko, Oklahoma, covering allotted Indian lands located in Caddo, Comanche, Cotton, Grady, Kiowa, Stephens and Tillman Counties, Oklahoma. For information, write or telephone Mrs. Schroeder, Anadarko Area Office, Phone 788.





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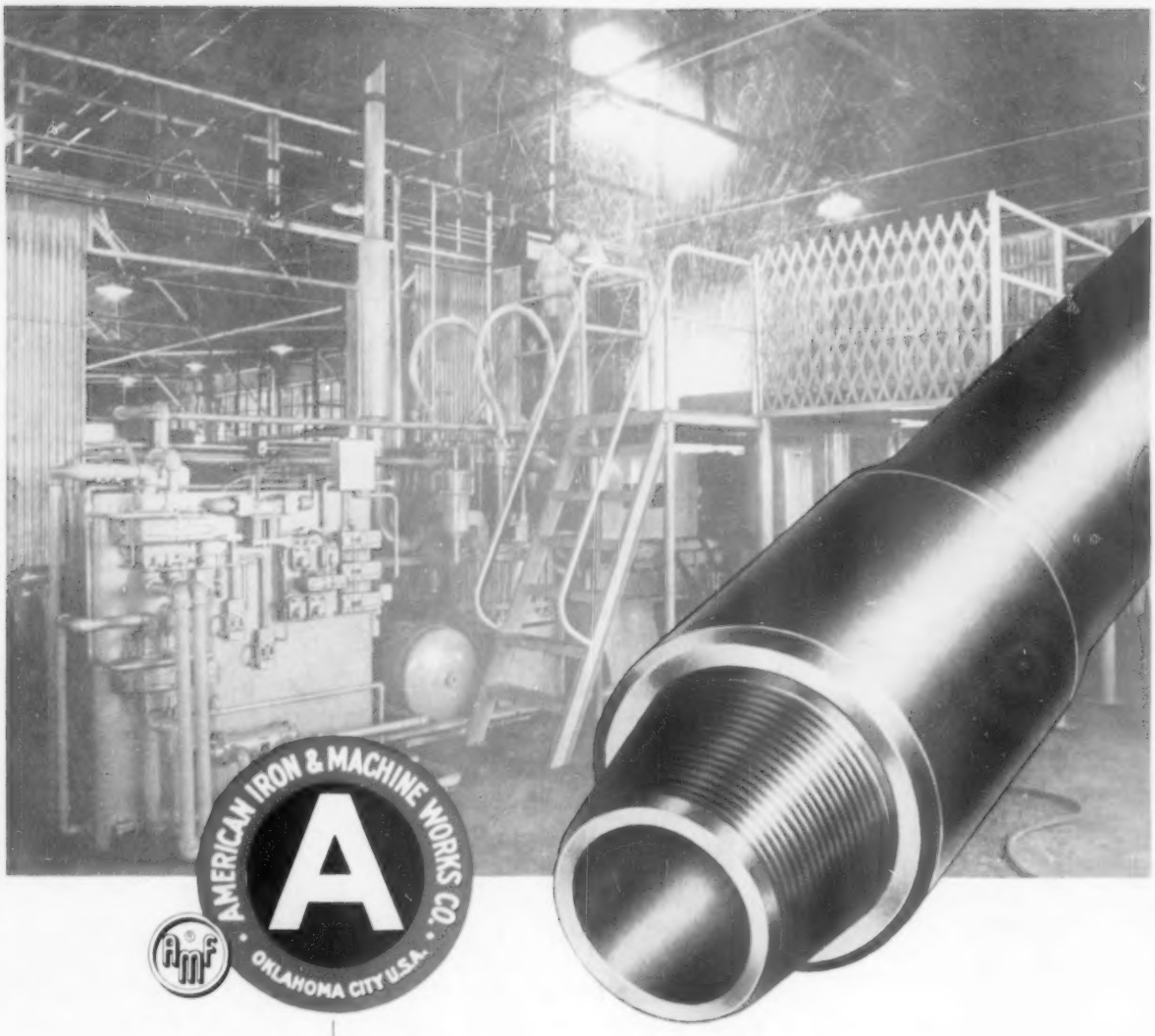

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